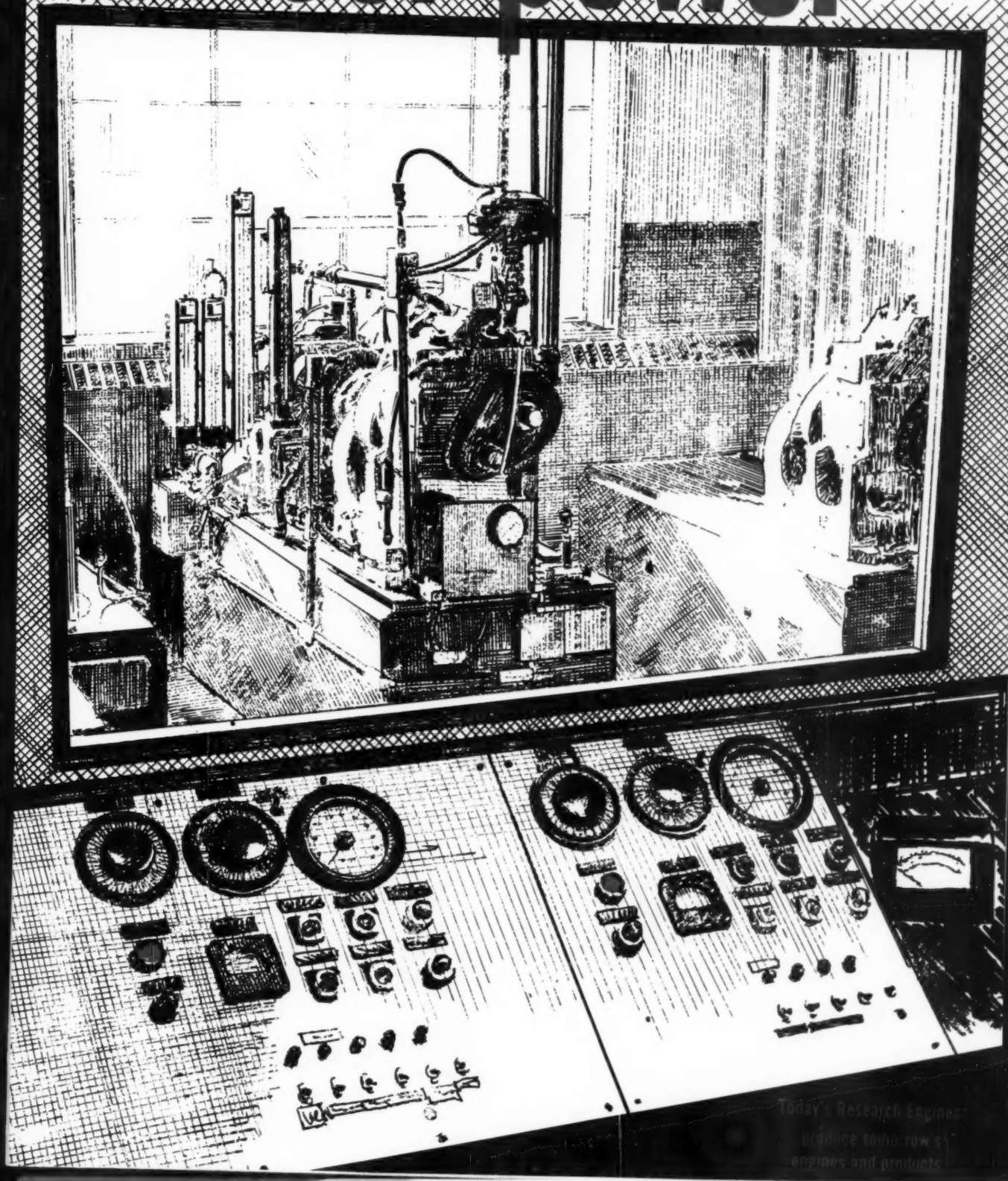
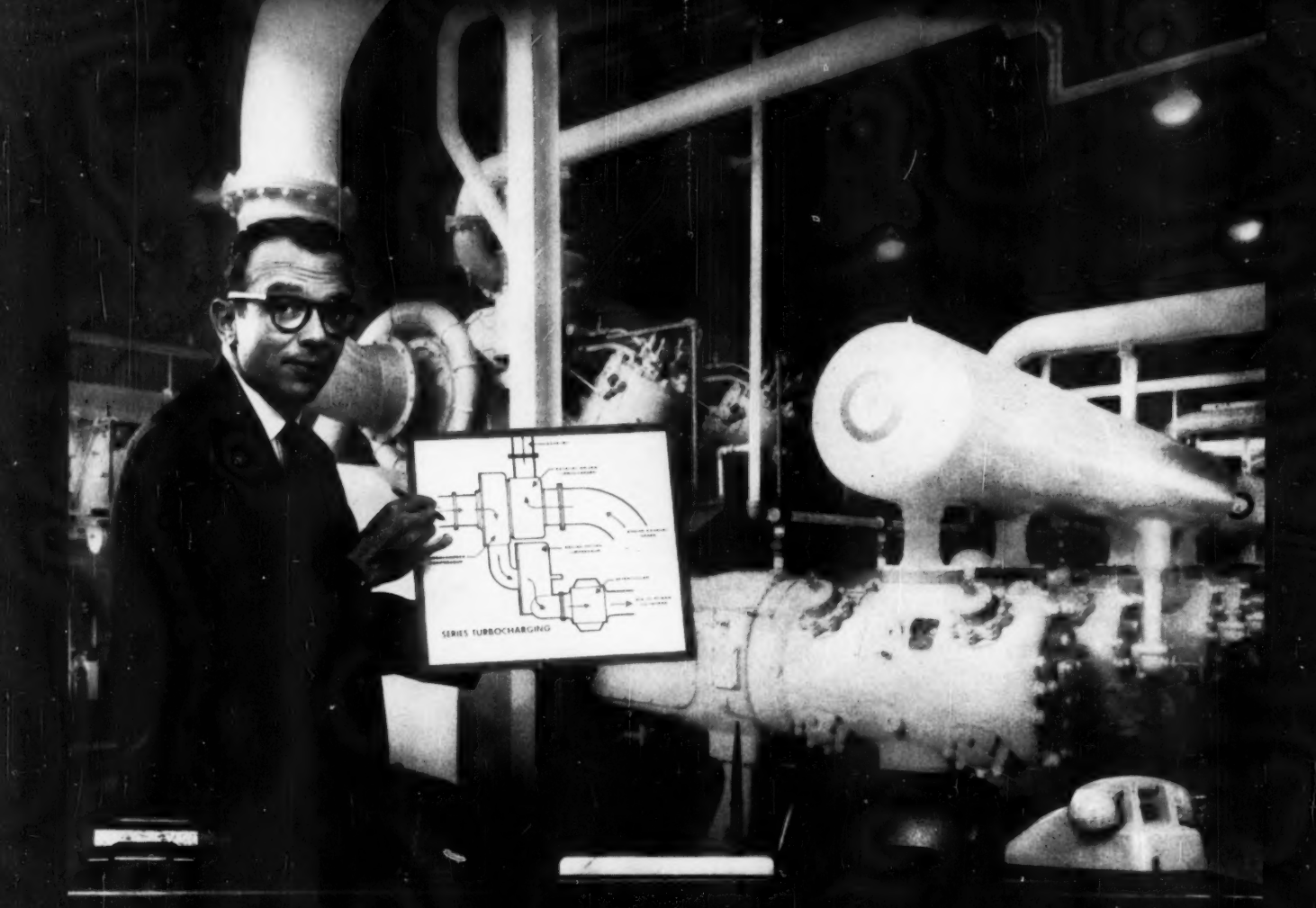
diesel power

February
1960



Today's Research Engines
produce tomorrow's
engines and products



Donald L. Reed, *Manager Gas Engine Compressor Sales, The Cooper-Bessemer Corporation, explains . . .*

How we now make engines do 40% more work

The diagram shows a recent major development in feeding air to the power cylinders of Cooper-Bessemer's big engine-driven compressor units. This unique "*series turbocharging*" overcomes many former supercharging limitations and successfully boosts air supply for better combustion, more effective scavenging of exhaust gases, greater efficiency and increased power!

As a result, gas transmission, petroleum and chemical companies are getting 40% *more* power with these new V-angle compressor units than with predecessors of the same bore, stroke and speed. Or, for a given job, this means less fuel consumption and much lower costs for housing, foundations, piping and year-in, year-out operation.

Find out what cost-saving advancements Cooper-Bessemer can apply to *your* needs in power and compression facilities. Call our nearest office.

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WHY PEDRICK'S

Conformable

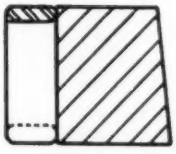
TAPER-FACE COMPRESSION RING

GIVES MAXIMUM PERFORMANCE IN BIG-BORE ENGINES

Recommended especially for 4-cycle engines.

Big reason is unusual conformability of this Pedick design under every sort of cylinder condition. This important advantage is the result of Pedrick's exclusive "Equalizer" steel expander ring that exerts a uniform pressure all around the cast-iron cylinder contacting ring. The cast-iron section is radially thinner, much more flexible.

The taper-face of this conformable compression ring initially provides a line contact with the cylinder wall. You benefit from higher unit pressure, quicker seating and sealing, less chance of scuffing the cylinder wall.



TF7 DESIGN
U.S. Patent No. 2,771,329

The TF7 design shown here is one of the many *specialized* designs developed by Pedrick to provide users with the best combination of rings for maximum results in each installation. The right ring in the right place is your best guarantee of long-lived, dependable, low-cost operation. You're invited to call on our Engineering and Consulting Service to help you solve your particular ring problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa., Tel.: SAratoga 9-3770. *Canadian readers:* Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *conformable* RINGS FOR BIG-BORE ENGINES

New Eaton Process Cuts Costs of Alloy-Faced Valves

The new Eaton ECONOSEAT process of applying heat resistant and corrosion resistant material to valve faces makes possible a worthwhile reduction in the amount of costly protective alloys required.

If you have hesitated to use high-alloy-faced valves because of cost—or are now using valves conventionally faced and are interested in reducing costs—you will want complete information about the advantages of Eaton ECONOSEAT Valves. Eaton engineers will be glad to consult with you without obligation.

EATON

Call on Eaton engineers to discuss with you the possibilities of applying the ECONOSEAT process to parts, other than valves, requiring protective coatings.

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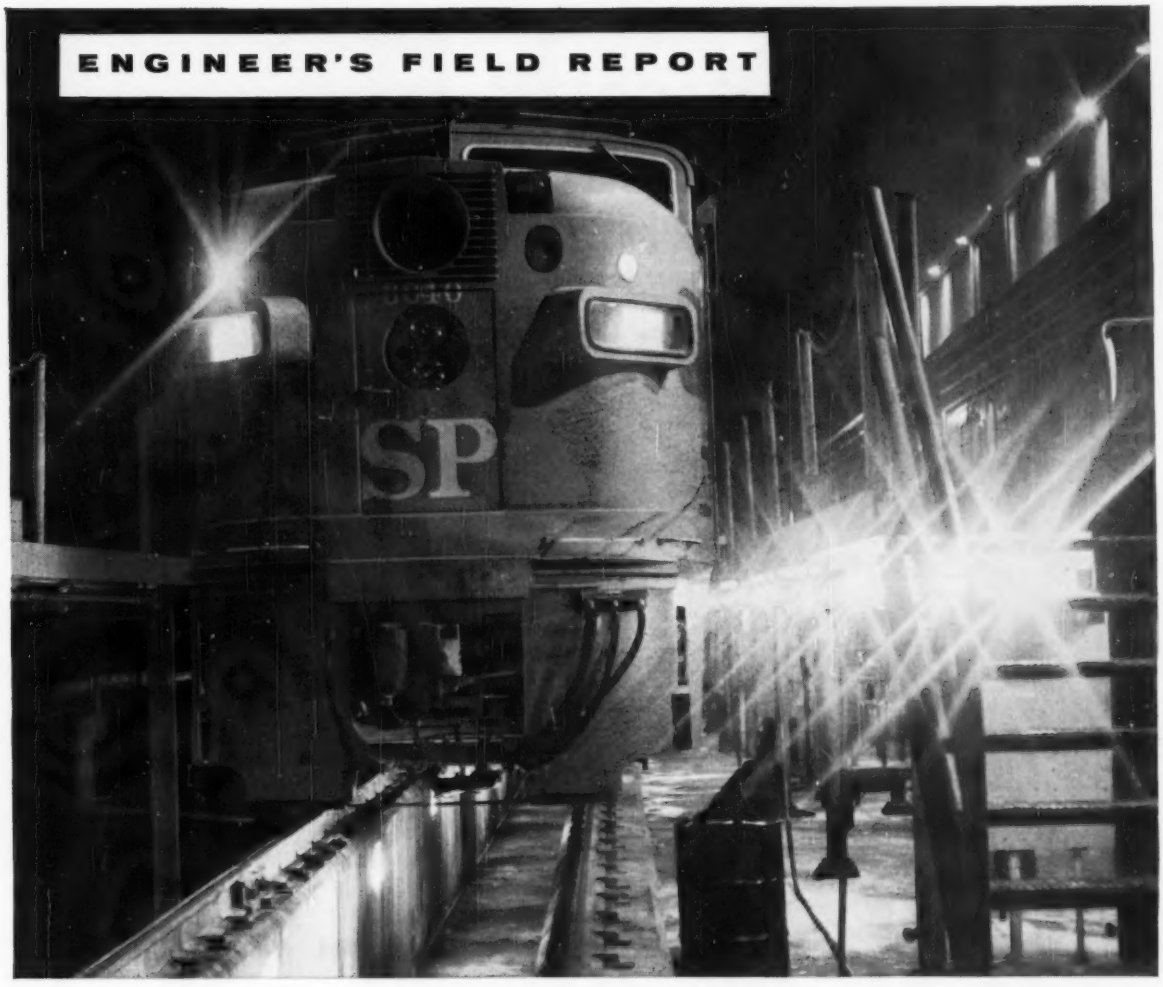
BATTLE CREEK, MICHIGAN

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Gears • Hydraulic Pumps Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes Powdered Metal Parts • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems



RPM DELO Oil holds down maintenance costs for...SOUTHERN PACIFIC

Judge any way you like: test results or mechanical and operating department records. You'll find that "RPM DELO" reduces wear and keeps engines clean between regular overhauls. That's why Southern Pacific, like so many other major Western Railroads, continues to use RPM DELO Oil.

Longer service life was the objective more than 20 years ago, when Standard Oil Company of California developed the first successful compounded oil for high-speed diesel engines.

Though rudimentary by present-day standards, this first "RPM DELO" lowered operating costs to economical levels, stimulating diesel engine design.

By preventing ring sticking, reducing engine wear, and maintaining a satisfactory level of overall engine cleanliness, RPM DELO Oil quickly won approval of engine manufacturers.

Constant research, both independently and in cooperation with SP and other forward-looking railroads, has kept "RPM DELO" ahead of diesel engine design and use.

Today, a complete family of RPM DELO Oils gives railroad users a choice of lubricants for various engine designs, operating conditions and fuel characteristics.

Like more information? Just call your local representative, or write:

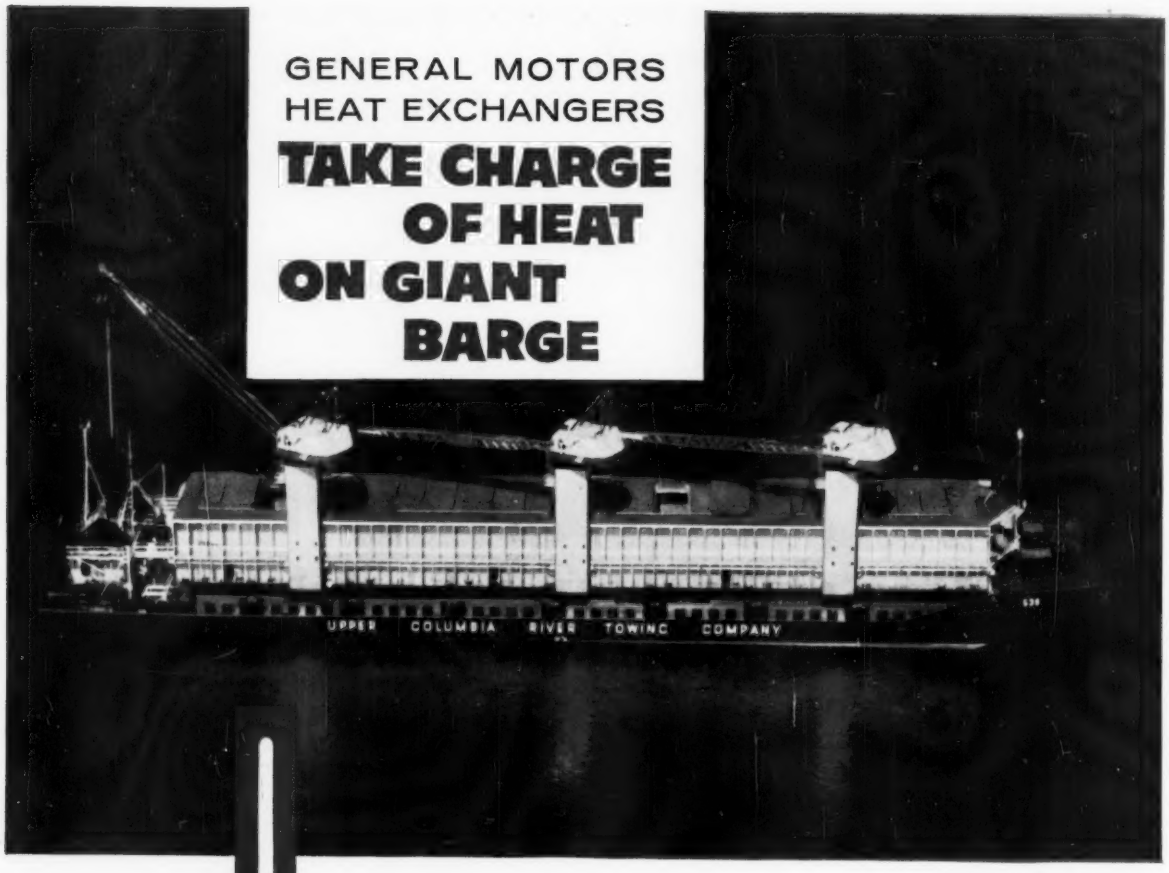
LUBRICATING OILS RPM DELO

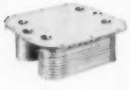
STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • **STANDARD OIL COMPANY OF TEXAS,** El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • **THE CALIFORNIA COMPANY,** Denver, Colorado

TRADEMARKS "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

GENERAL MOTORS
HEAT EXCHANGERS

TAKE CHARGE OF HEAT ON GIANT BARGE





Harrison Heat Exchangers —Reliable Products of General Motors Research and Engineering.

RELIABLE HARRISON OIL COOLERS SPECIFIED FOR DIESEL POWERED PUMPS AND LOADING EQUIPMENT

The world's largest barge—299′ long, 75′ wide, hull depth of 21′—ranges the Pacific Coast from the Bering Sea to Mexican Coastal Waters! Delivery of cargoes to busy ports demands the ultimate in reliability and efficiency of cargo-handling equipment. The four GM Diesel-driven deep-well pumps have a combined capacity of 14,000 g.p.m. for liquid cargo. Each of the three GM Diesel-driven cranes has a lifting capacity of 25 tons for dry bulk cargo. The barge's lighting and ventilating requirements are handled by GM Diesel-driven generators. And Harrison heat exchangers cool the oil for all of these engines! Harrison—with a half century of experience in the heat-transfer field—assures you of top-quality products that are researched and engineered to control vital temperatures with maximum efficiency. The most advanced industrial, aviation and marine equipment relies on Harrison heat control equipment. If you have a cooling problem . . . rely on Harrison for the answer.

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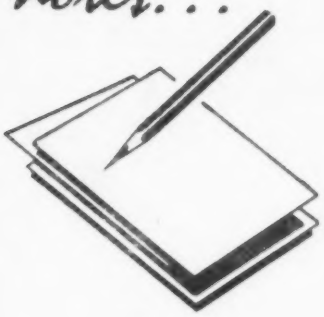
HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

editor's notes...



You'll want to read about...

Texaco's trouble-tracker-downers is the subject of a 4-page photo-story starting on Page 24.

If you're interested in "mating" the correct oil to your engine, well this one'll be right down your alley. Step by step, you'll follow Texaco's Research Center engineers as they investigate and solve a field problem . . .

What's new in remote control operation? Well, the newest of the new is an oil pipeline in the far West. From one end of its 650-mile length to the other it's run completely unattended! Microwave is the answer. And small diesel engines supply the necessary power. A new application idea that's opening up new opportunities for diesels. Story starts on Page 28 . . .

You'll find Today's Diesel Man on Page 32—he's out in the Pennsylvania coal fields in freezing February cold tackling a tough problem . . .

What's the poop on CAV's DPA fuel injection pump? You'll get the latest lowdown on why the British "borrowed" the RoosaMaster pump design. Our story begins on Page 34.

You'll want to read about...

Been having valve trouble? If so, you'll want to read our story on Page 39. "Extra Protection For Engine Valves" gives you the word on a new metallic powder spray that stops burning, erosion and necking of those valuable valves . . .

Three new engines from Perkins — and each designed for specific applications. That's the subject of our story starting on Page 41 in this issue. It'll keep you posted on the latest from England . . .

Every so often an exceptionally important story comes along. And we feel W. E. Irwin's "Broken Crankshaft? Why?" is one of them. You'll find it near the back of the magazine on Page 44 . . .

ESTABLISHED IN 1923
FEBRUARY, 1960 VOL. 38 NO. 2

diesel power

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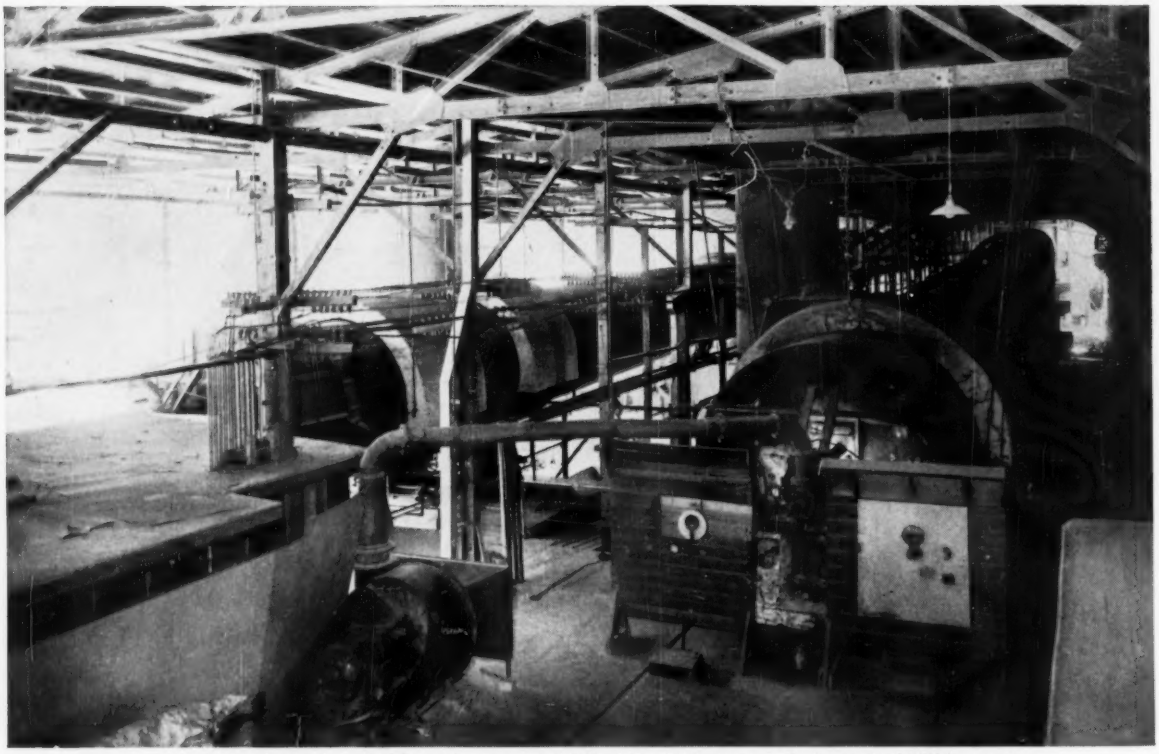
BPA



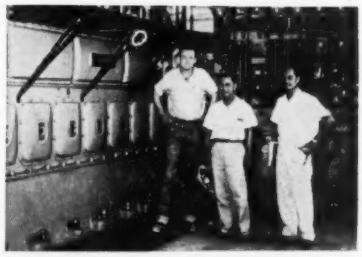
Two of four kilns now in operation at Rizal Cement Company plant. With fourth kiln added, unit capacity has increased to 20,000 bags per day.

LARGEST PHILIPPINE CEMENT MILL USES ENTERPRISE DIESELS WITH BENDIX FUEL INJECTION

Located just 22 miles from Manila in the town of Binangonan is the Rizal Cement Company. Since its construction in 1914, Rizal has been a major factor in the advancement and development of the Philippine economy. Ever-increasing production requirements since the close of World War II have necessitated major modernizations. A key factor in this expansion was the installation of an Enterprise DSC-38, 1000-kilowatt, turbo-charged diesel generator unit, equipped with Bendix* Fuel Injection equipment. This unit brought the plant's capacity to 3,000 barrels daily, more than six times its original capacity.

Still greater power requirements necessitated the installation of three Enterprise DSG-6's, rated at 325 kilowatts each. Then, finally, in 1958, another Enterprise DSQ-38, 1250-kilowatt diesel was installed, along with fuel treatment equipment converting the other Enterprise Diesels to selective fuel operation. Capacity is now 5,000 barrels per day.

Use of Bendix Diesel Fuel Injection on all these power plants reflects the confidence that engine builders have always had in this superior equipment. It assures dependable, economical performance around the clock—and, of course, full-time operation is a necessity in a profitable cement plant. For full information on this quality equipment, write Scintilla Division, Bendix Aviation Corporation, Sidney, New York. *REG. U.S. PAT. OFF.

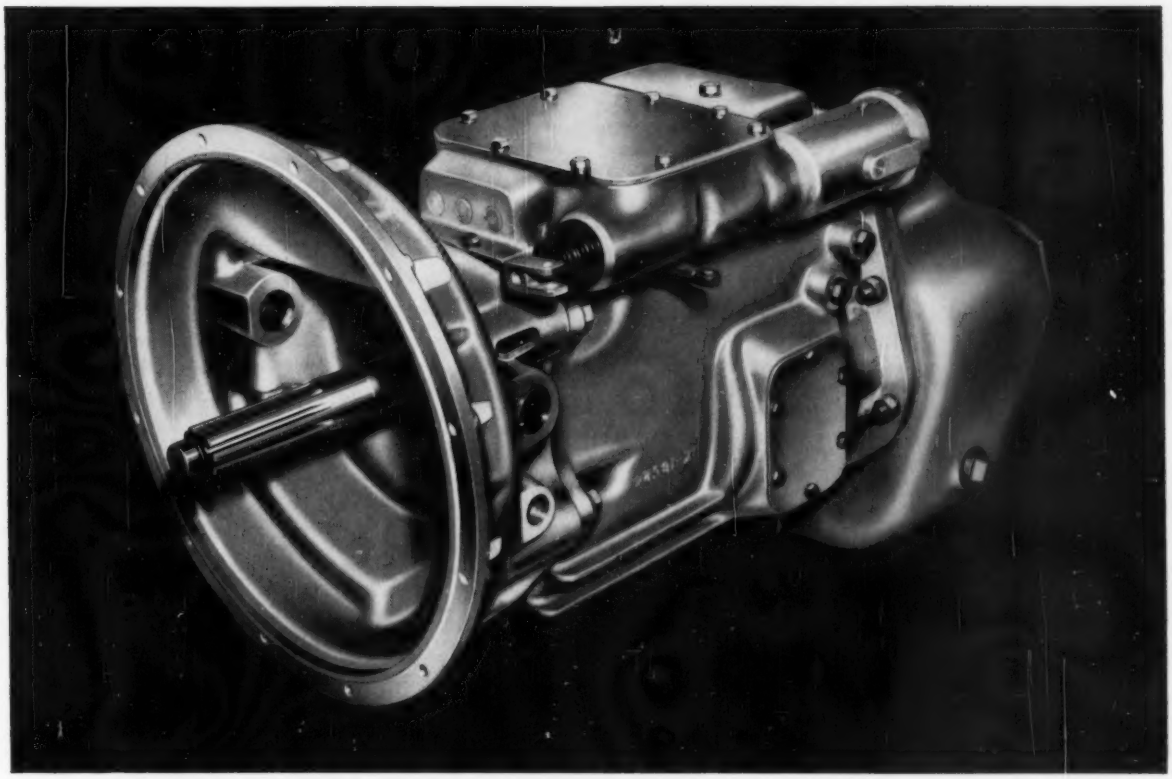


Bendix Fuel Injection equipment is used on all Enterprise Diesel engines at the Rizal Cement plant.

Scintilla Division
Sidney, New York

Bendix
AVIATION CORPORATION

Export Sales & Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.



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57 years of manufacturing experience...

millions of heavy-duty transmissions...

This is the experience background of Clark's new, lightweight 9-speed transmission . . . a background which gives you:

- ***Light weight.*** **Transmission, complete, *weighs only 515 lbs.* All aluminum housings.**
- **Designed for highway trucks in the *250 to 300 hp range.***
- **9 speeds with ratios matched to the demands of modern diesel hauling. Low-gear ratio, 9.35 to 1, starts heavy loads easily.**
- **Drop-type output shaft, making possible *shorter vehicle wheelbase.***
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- **Low silhouette, provides clearance under cab or trailer.**
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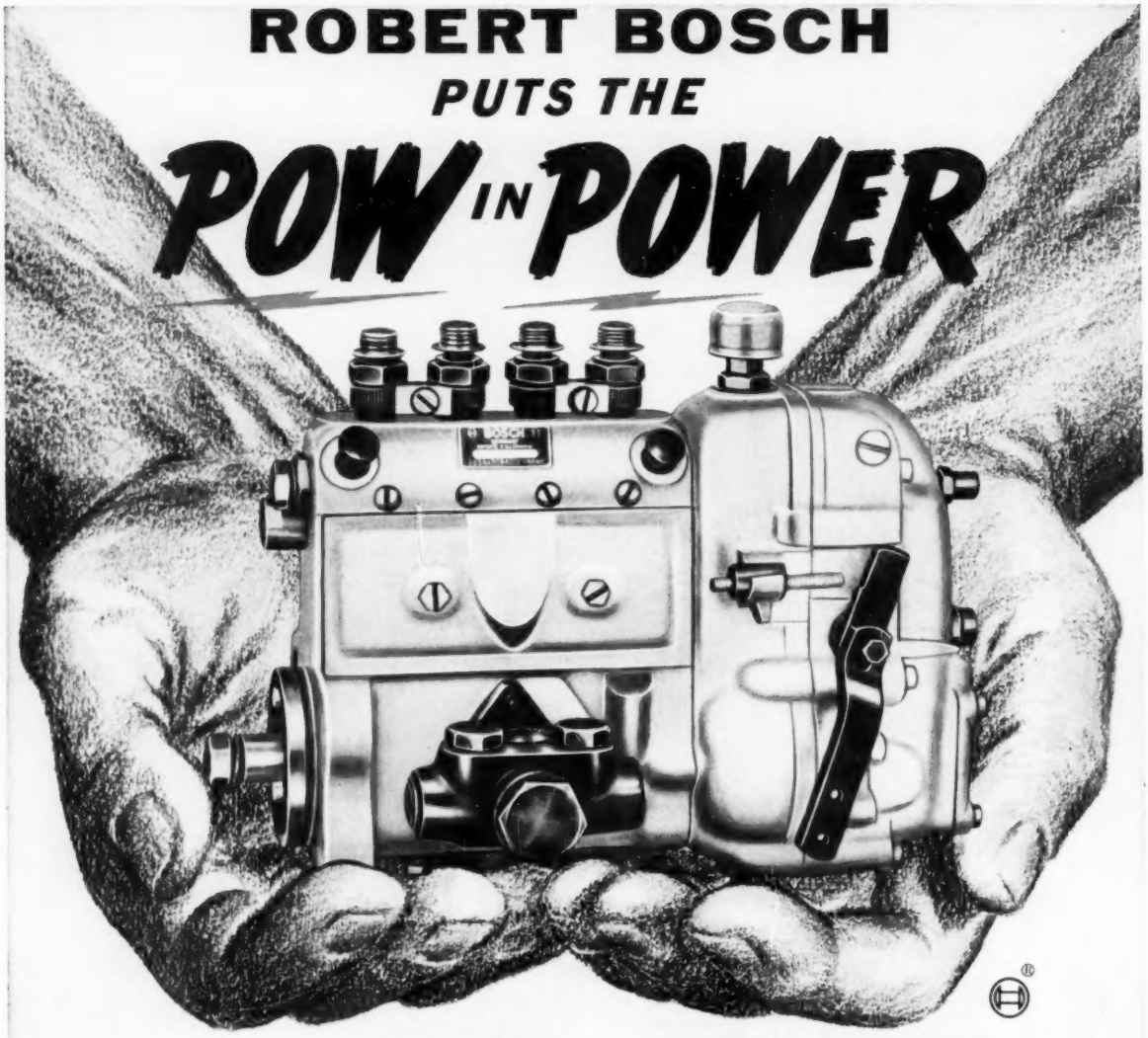

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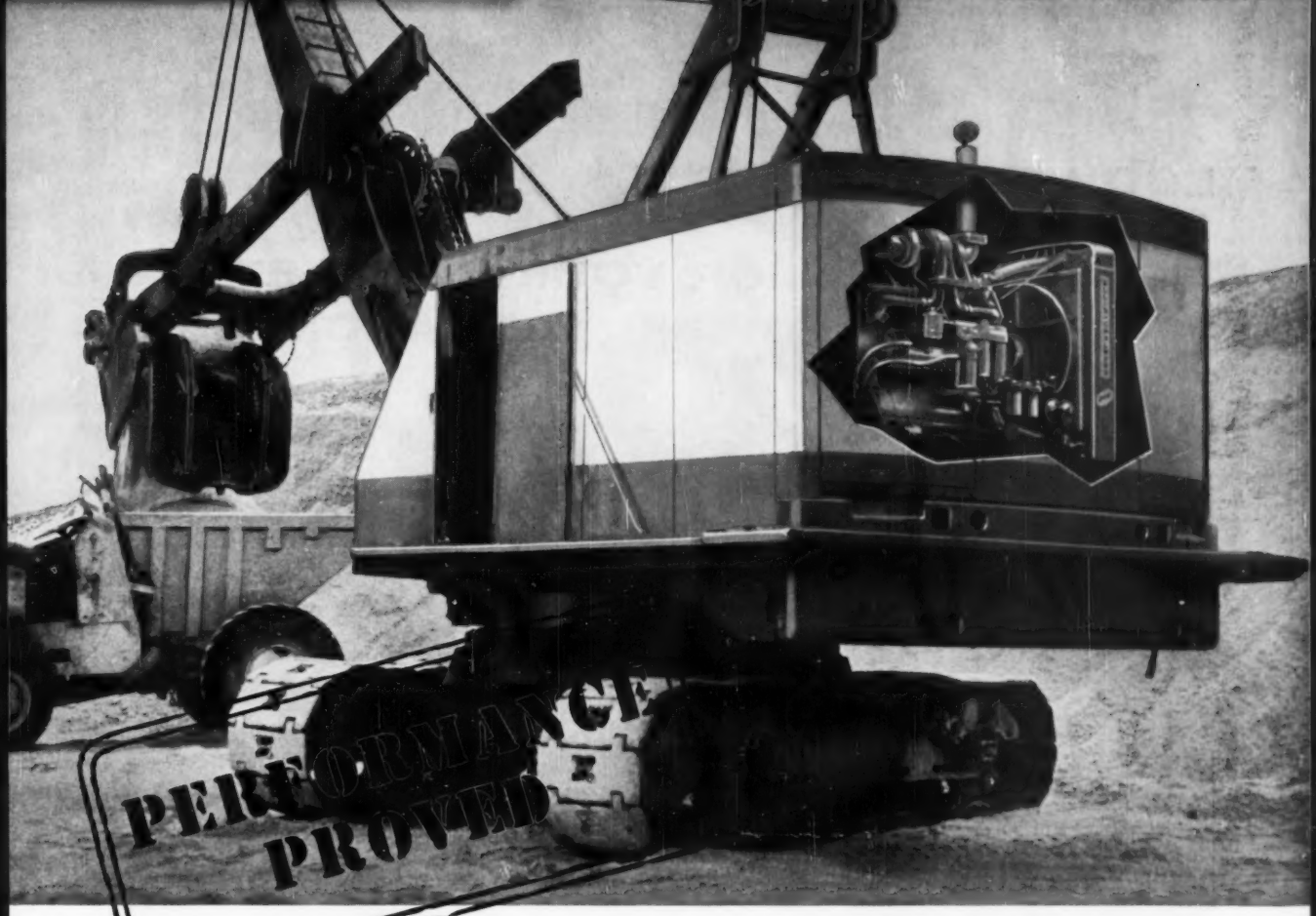

"We tried burying the bucket in the bank but couldn't... thanks to that 21000 diesel"

— That's a comment on performance of the Allis-Chalmers 21000 diesel repowering a 2½-yd shovel belonging to the Electro-Metallurgical Co., Ltd., Killarney State, Ontario.

PERFORMANCE PROVED

"It now seems to have twice the power," says the operator of a Pennsylvania-owned machine in which a 16000 diesel replaced the original engine of another make.

PERFORMANCE PROVED

"17% less fuel, 30 minutes less trip time" — These are the savings effected when a 21000 diesel repowered a truck operated by a logging company in Idaho.

PERFORMANCE PROVED

"Plenty of reserve, with economy and dependability to boot," states the owner of Minnesota Construction Company, who has several pieces of equipment powered by 16000 and 21000 diesels.

"We can hardly believe the fuel economy" — "'Startingest' engine we ever had" — "Don't understand why anyone would want an old-fashioned 'smoker' again," comment others. Everywhere, on every type of installation, the amazing 16000 and 21000 are "performance proving" their greater economy, their top usable power, their superior starting. If you want diesel advantages like these, see your Allis-Chalmers dealer for details. Allis-Chalmers, Milwaukee 1, Wisconsin.

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BC-25

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FOR YOUR COMPLETE DIESEL FILTRATION NEEDS

You get the right filter plus expert application engineering when you rely on CFC. Here's why:

CFC Filters include a wide range of models for lube oil and fuel filtration.

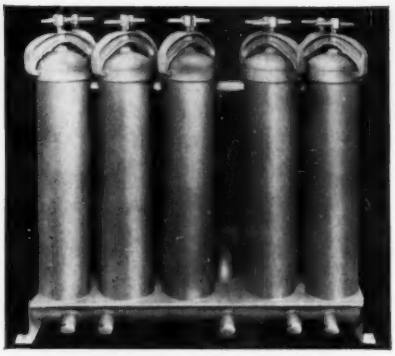
There are many types for both depth and surface full-flow filtration; by-pass; and shunt systems.

Experienced CFC Engineers will analyze your individual requirements and recommend the exact filter for your application.

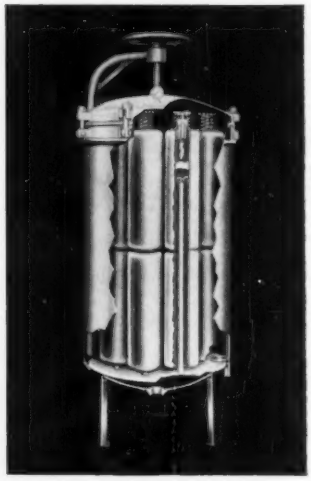
Write Dep't DR

Filter out high costs with CFC Filters

CFC Fulflo Filter: Single-tube filter, with patented Honeycomb Filter Tubes, for true *depth* filtration. Multi-tube models also available.



CFC Michiana Filters: Variety of models available for 150 hp engines to 3,300 hp. Designed to fit limited space.



CFC Honan-Crane Multi-Cartridge Filter: Choice of seven types of filter cartridges includes inert media for removal of solid contaminants or Cranite (Fuller's Earth) for removal of solid particles and all products of oxidation.

CFC

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PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

GET REAL PRODUCTIVITY—GET A GM DIESEL ENGINE

Like to cut your fuel costs and save over two thousand dollars per overhaul?

That's what is being done by R. P. Waldie, General Manager of Rocky Mountain Mining and Transport Company, uranium ore haulers in Grants, New Mexico.

Here's what he has to say about this Diamond T, eighth GM Diesel powered unit to be added to his fleet.

"GM Diesel engines cost us less to operate and average less time in the shop than any other power plant we have in the fleet. We're averaging 5.5 m.p.g. with this unit compared to 4.5 m.p.g. on our trucks that are powered with another make Diesel."

Rocky Mountain Mining and Transport hauls uranium ore from mine to mill. They operate at an altitude of 6200 feet . . . haul up to 60,000 lbs. GCW over tough grades in temperatures as low as 14° below zero.

When it comes to overhaul costs Mr. Waldie says, "We're getting an additional 60,000 to 100,000 miles between overhauls on our GM Diesel powered rigs. Also, we figure it costs us about $1500 to do a major on a GM Diesel and about $3700 on the other make. We save on operating and overhaul costs and get more time on the road."

You'll find your productivity and profits climbing, too, if you put GM Diesels to work for you. See your GM Diesel distributor, or write direct for more information.

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GENERAL MOTORS, DETROIT 28, MICH.

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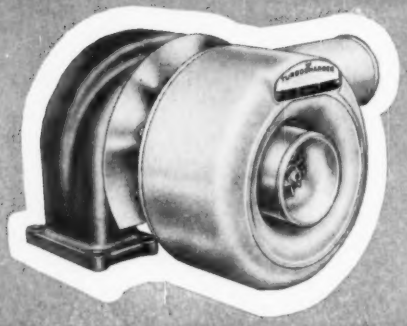

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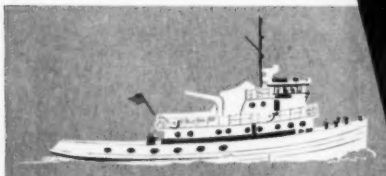

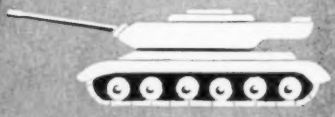

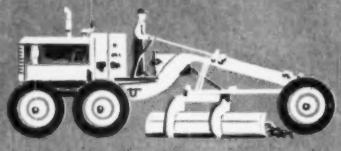

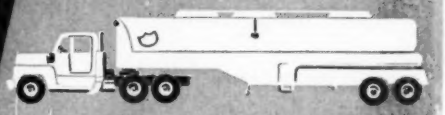

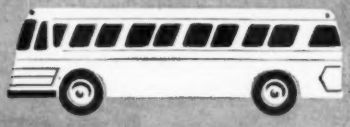

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editorially speaking

Cerebrating on Calibration

Industry standards, we need. Let's suppose that there were none in the fuel injection equipment field and see what could happen. We can think off-hand of ten major systems in use, four of engine builder's design. Most makes include different sizes and types of pumps, further complicating things. Now, each manufacturer develops calibration data for his pumps. He does this on his test stands with a certain test fluid, test lines of controlled size, shape and length and special calibrated nozzles. This all adds up to a formidable array of specs but figured from different benchmarks. Now suppose that you run a fuel injection equipment repair shop. You're franchised in, say, three makes of equipment but to make a go of it and for customer accommodation you have to be set up to handle most lines. You buy good test stands and a goodly stock of necessary hardware. You dig up all the calibration specs that you possibly can. Now you're set to go — or are you? You find that the specs don't give you all you'd like. Take test fluids for example. You might get test temperatures but where do you measure them? . . . at the sump? . . . pump return? . . . where? And what about "standard" nozzles? . . . what type? . . . how long do they stay standard and how do you know when they're off? . . . what practical procedures, such as a test pump program, are available to check them? These are just a few of the problems that could face the technician in the field under our "supposed" situation of a lack of industry standards. Supposed, hell — this is the situation as it exists today. Every fuel injection shop — authorized service shop, engine distributor's shops (they work on all kinds too) — faces this situation in trying to restore equipment to factory specification. It's to their everlasting credit that they do as well as they do. But it's not good enough and recognition of need for something better — industry standards — is evidenced by work of the ADS and SAE's Fuel Injection Equipment Subcommittee. This committee is making progress as interested manufacturers are finally realizing that it is to their immediate benefit for the industry to have standards. It has taken a long time. January's SAE Journal outlines preliminary agreement in the areas of test fluids, test nozzle opening pressures and test line sizes and bends. The report's title carries an unfortunate implication of engine "damage" by "poor field calibration". We doubt that this accurately reflects the viewpoint of Subcommittee members or that they meant to point any fingers. In fact, they have asked the ADS to work with them in establishing practical, definitive standards. Why not? It's to everyone's advantage — engine builder, fuel injection equipment maker, the shops and engine owners. Standards, we need; let's get them fast.

B. P. E.

UDT-817 power crushes 300 cu. yd. of 1¾-in. minus caleche rock hourly

This is a Texas-sized crushing job—300 cu. yd. of caleche crushed to 1¾-in. minus size hourly—and the new 6-cylinder turbocharged International UDT-817 diesel does it with power to spare.

The West Texas Construction Co., Lubbock, is crushing 20,000 yd. of caleche for road base material at this pit near Perryton for a 5-mile state road improvement contract. The big new International UDT-817 power unit is delivering only 265 cont. hp. @ 1800 rpm. on the Universal impact crusher with production being limited only by feeder capacity. About 85% of the caleche requires crushing.

Other International power on the job includes a UD-18A diesel on the Jaeger 315 air compressor operating the wagon drill boring dynamite holes and a carbureted U-264 engine on the Universal feeder.

While the new 385 hp. UDT-817 diesel heads up the International engine line, you can choose from 31 other diesel and carbureted models ranging upward from 16.5 hp. Save on repowering and operating costs by checking your International Power Unit Distributor or Dealer or by specifying dependable International power in new machines. All 32 International engines have one common feature: Fastest payback power.

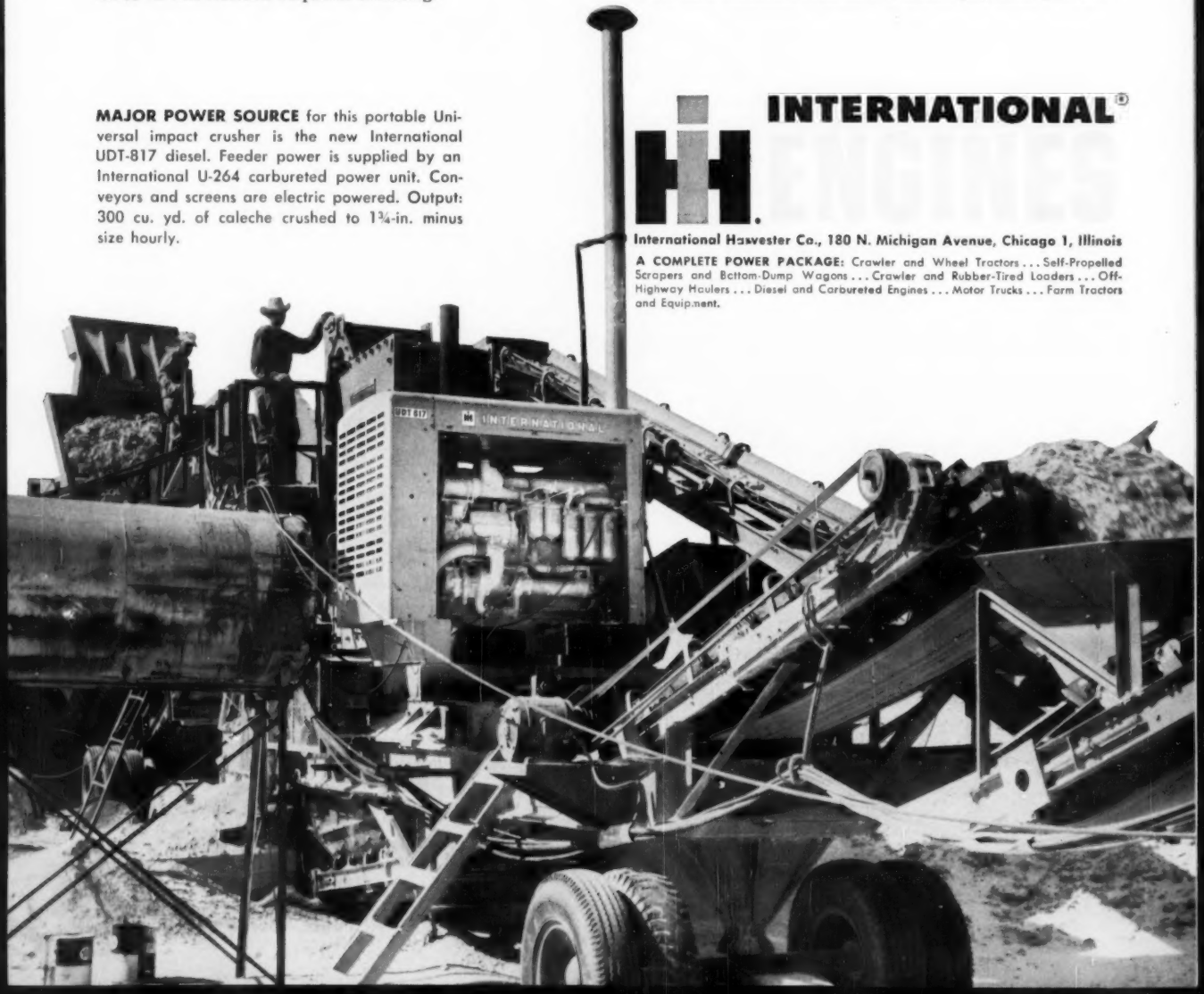
MAJOR POWER SOURCE for this portable Universal impact crusher is the new International UDT-817 diesel. Feeder power is supplied by an International U-264 carbureted power unit. Conveyors and screens are electric powered. Output: 300 cu. yd. of caleche crushed to 1¾-in. minus size hourly.

INTERNATIONAL®

ENGINES

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.



diesel power news section highlights

SAE TAKES LOOK AT DIESEL FOR ALL TRUCKS

Recent SAE Metropolitan Section Meeting in New York City was jammed. Of interest was healthy attendance by people representing oil companies, truck manufacturers, engine distributors – men who have to know which way the wind is blowing. Magnet was Earl R. Klinge from Ford's Advanced Truck Product Engineering, speaking on the provocative subject: "All Trucks Can Be Diesel – Fact or Fancy?" And he made a good strong case for "fact" rather than "fancy". Audience interest at this meeting – and at others around the country – backs up our contention that there's real grassroots interest in diesels for a broader range of truck sizes – and its growing.

AND PRIVATE TRUCKERS LOOK AND LISTEN TOO

Good deal of first session of the Private Truck Council's 21st Annual Convention was devoted to "Diesel Round-Up". And everybody was talking diesels for light-load-short-haul. And, more important, everybody was listening and listening hard. Speakers were from Mack Trucks, Cummins, Layland and Detroit Diesel. We don't have to spell out in detail what was said – because it's what you've been reading all along in DIESEL POWER.

DETROIT DIESEL'S BIGGEST PEACETIME YEAR

A whopping big year was reported by GM's Detroit Diesel. Total increase amounted to 2 million hp over 1958! DD's general manager, Clyde W. Truxell, attributed this sales success to "product improvements and a widely expanded line of engines." Over 300 GM models, ranging from 20 to 1650 hp, are now used in over 2200 different kinds of equipment in the industrial, construction, trucking, farming, marine as well as other fields.

$3,196,654 Contract for International TD-20 Crawlers

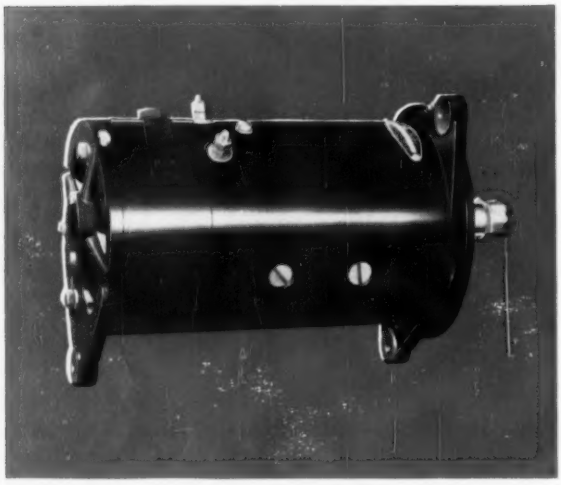
U. S. Army Corps of Engineers signed a contract with International Harvester for 180 of their TD-20 Crawler Tractors. Powered by 134 hp engines, each Crawler will come equipped with cable-control bullgrader blades and front cable controls, five floodlights and one headlight. Rearmounted P-29 winches are planned for 144 machines, other 36 will carry Carco G-4 winches. All 180 Crawlers are to be built in the company's Chicago Tractor Works.

DIESEL-HYDRAULIC LOCOMOTIVE FOR DENVER & RIO GRANDE

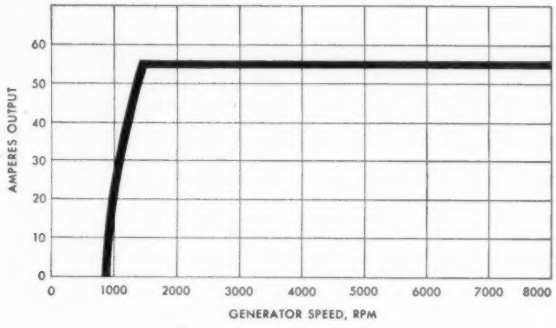
Three German-built locomotives with hydraulic drive are scheduled for delivery to the Denver & Rio Grande Western RR. late in 1960 or in early 1961. The 4000-hp units will be built by Krauss-Maffei AG, Munich. Two high rpm, 16-cyl. turbocharged Maybach engines will drive through a hydraulic torque converter, fluid coupling, gear package. Stated objective is to cut high maintenance cost associated with electrical components on diesel-electrics. Will be interesting to watch results. Irony of situation is railroaders resisted American hydraulic-drive offerings . . . . thought up strong arguments against buying even one.

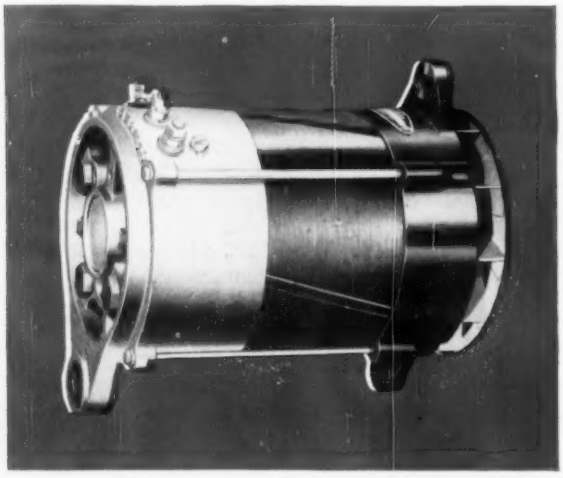
MORE INDUSTRY NEWS FOLLOWS ►

TAILOR YOUR TRUCKS

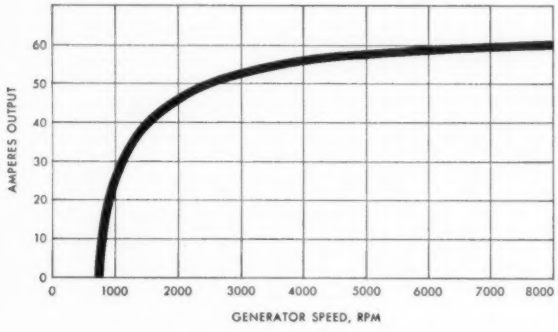


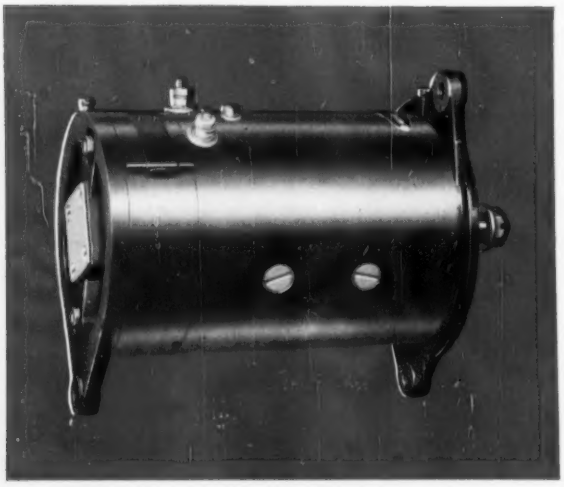
1106991 EXTRA-OUTPUT D.C. GENERATOR—12 volts • 55 amperes • 12 amperes at idle—For cross-country trucks, school buses and other vehicles with extra electrical equipment.



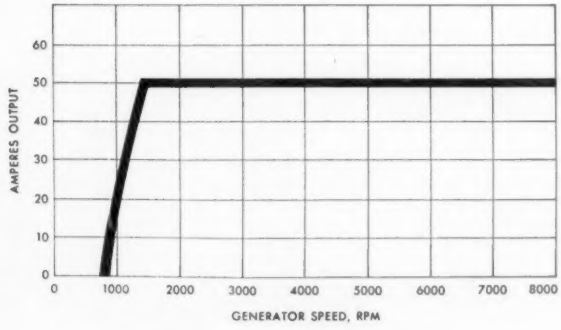


1117070 SELF-RECTIFYING A.C. GENERATOR—12 volts • 60 amperes • 27 amperes at idle—For high-duty vehicles with heavy electrical loads . . . operating at all speed ranges. Ideal for excessive low-speed operation and curb-idling.

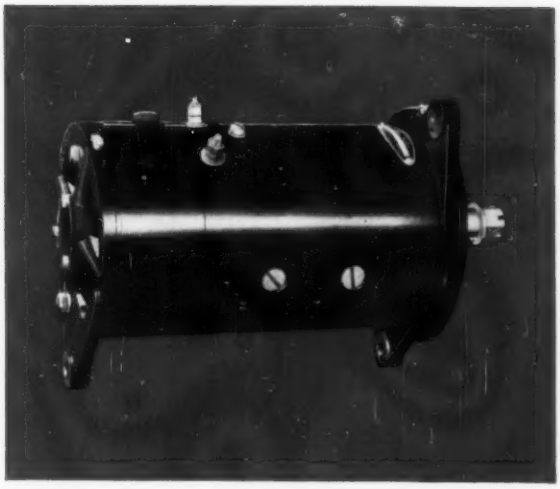




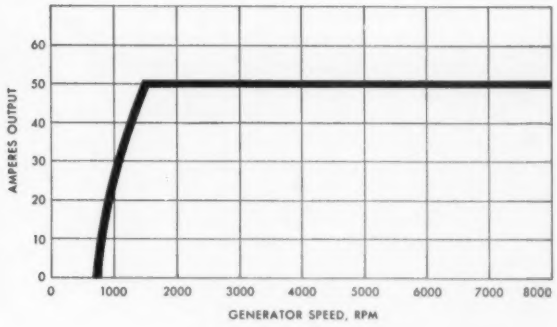
1106985 EXTRA-OUTPUT D.C. GENERATOR—12 volts • 50 amperes • 14 amperes at idle—Short frame generator for difficult mounting applications. For vehicles in city and suburban use. Not for cross-country operation.

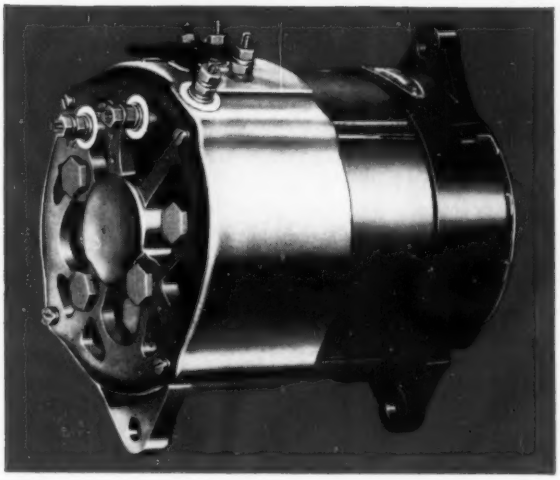


TO JOB CONDITIONS

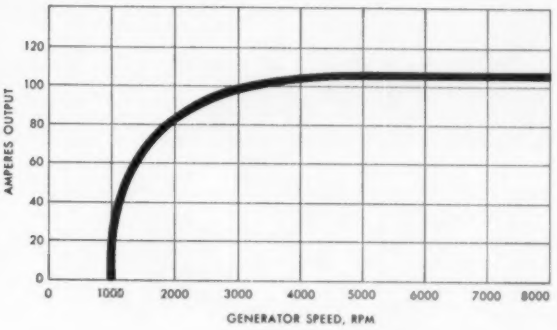


1106986 EXTRA-OUTPUT D.C. GENERATOR—12 volts • 50 amperes • 20 amperes at idle—For metropolitan trucks and school buses, with extra electrical equipment . . . operating at low speeds and with engine idling most of the time.





1117115 SELF-RECTIFYING A.C. GENERATOR—12 volts • 105 amperes • 10 amperes at idle—For high-duty vehicles with extra-heavy electrical loads . . . operating at all speeds. A.C. voltage available for 110 V conversion.



Delco-Remy offers a complete line of A.C. and A.C.-D.C. generators that are right for the job.

Demands on the electrical systems of trucks vary with their use. For best performance, whether the vehicles be new or already in service, the electrical equipment should be job-matched to meet those demands.

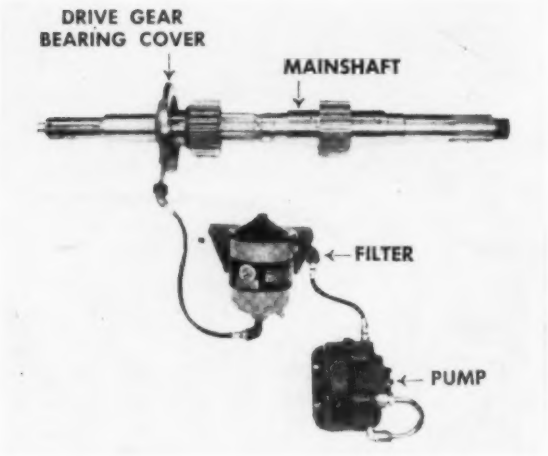
Do your trucks have extra electrical equipment? Operate cross-country, around town or off the road? Do they travel at sustained highway speeds, or with plenty of stop and go? Whatever their assignment, there are Delco-Remy extra-output generators and regulators job-matched to meet the electric power needs *exactly*.

Delco-Remy ELECTRICAL SYSTEMS

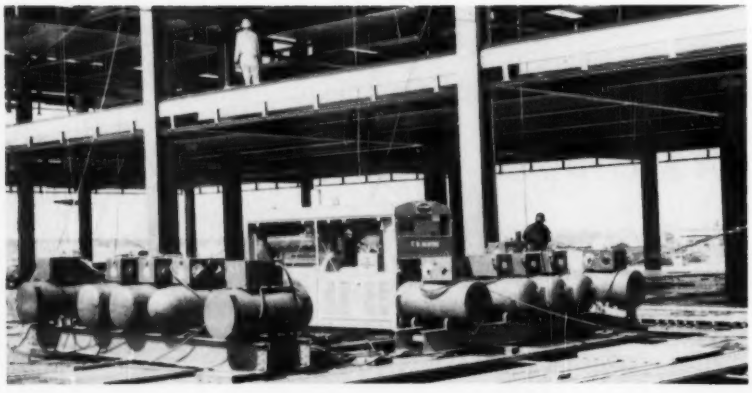
GM GENERAL MOTORS

FROM THE HIGHWAY TO THE STARS
DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

If You've An Old Alco Diesel
and are wondering where to get parts—wonder no more. Diesel Parts & Service, Inc. of Tulsa, Oklahoma, will supply you with just about any replacement part you may need. The only existing specs, jigs and dies for all engines built by McIntosh-Seymour, American Locomotive and Alco from 1915 to 1947 were turned over by Alco to this Tulsa firm. D.P.&S. supplies customers in all corners of the world with everything from pistons to pumps.



Fuller Manufacturing Company's
Transmission Division has a new pressurized filtration and lubrication system that will be standard on all Fuller transmissions for rugged off-highway use. As with engines, higher outputs, heavier loading have brought need for better lubrication through a pressure system, including filtration. Designed to eliminate excessive bearing and bushing wear due to contaminated gear oil, Fuller's system consists of a by-pass pump and filter that delivers clean oil at correct pressure whenever the transmission countershaft rotates.



Looking Like A Mother "Cat"
and her 15 kittens, this Cat D337-F Electric set supplies power for 15 300 amp Lincoln welders. This interesting use of diesel power saves time and money—one engine does the work of many and expensive tie-ins to local power are eliminated for F. B. McIntire Construction Co. in Fort Worth, Texas.

NEWS ABOUT PLACES, PEOPLE AND PLANTS FOLLOWS ►

Thru Mid-West-Eastern Route Nearer for "Double-Bottoms"

Truckers long-hoped-for dream of a through Midwest to Eastern seaboard route moved a couple of giant steps nearer last month. Both Ohio and Indiana are now running 6-month trials of tandem hook-ups over their super-highways.

This follows closely similar and successful "Double-Bottom" experiments on New York's Thruway and the Massachusetts Turnpike. Both states have now granted permanent authorization for tandem hook-ups on their new toll highways.

Big bugaboo up until now has been the absence of suitable roads in Ohio and Pennsylvania. But trucking industry spokesmen feel that "assurance of revenue-supplying truck traffic should count heavily in the minds of authorities considering new road construction in those states."

If and when Ohio and Indiana give the go-ahead, only a short 110-mile stretch between Warren, Ohio, and the N. Y. Thruway stands in the way of the through "Double-Bottom" link between Boston and Chicago. Tandem truckers, who can move far bigger payloads per hp eagerly await a favorable nod from the states.

World's Largest Mobile Drilling Rig Powered by GM Series 110 Engines

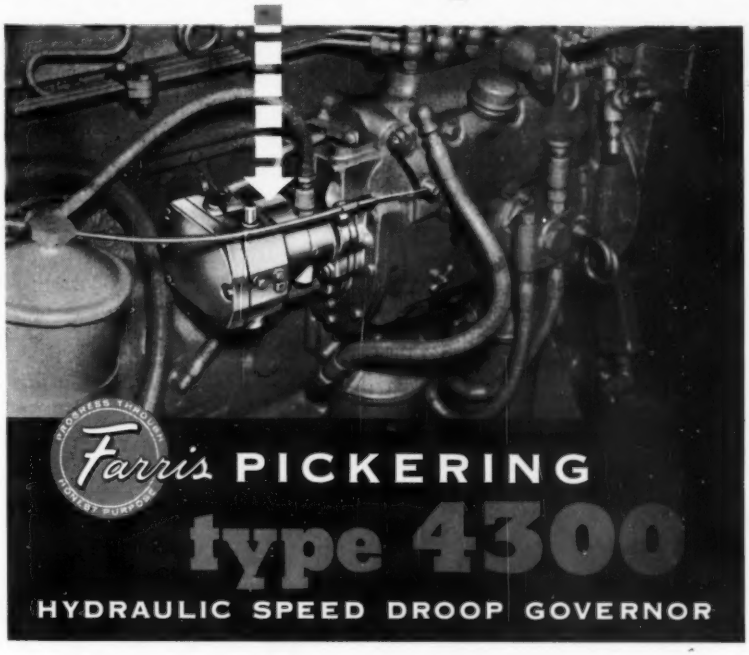
Arabian American Oil Company is now operating what they claim is the world's biggest mobile oil rig out in the sands of the Saudi Arabian desert.

Three General Motors Series 110 engines, equipped with torque converters, use their 636 hp to drive a National Supply T-32 Draw Works. There's a double helical reduction gear from No. 3 engine that connects to a side outlet propeller shaft, providing emergency power to operate slush pumps and an independent drive system.

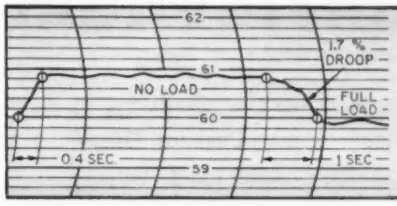
Weighing over 160,000 lb, the rig uses a 100-ft telescopic mast and has double decks for its various kinds of drilling equipment—all of which is mounted on a special trailer.

FOR LOW COST, VERSATILE CONTROL—

A New Hydraulic Governor with External Droop Control



Here is the economical, simplified way to control engine speeds PLUS external droop control for paralleling loads. The Type 4300 Farris Pickering governor is ideally suited for diesel engine pump adaptations . . . and it is the only low-cost hydraulic speed droop governor that permits you to put engine generator equipment in parallel with external control. This is required for certain government specifications. It enables you to equalize loads by adjusting droop while engine is running. Pressure medium for Type 4300 governors is ordinary engine oil. Use this compact unit for many purposes—generator sets, engine driven compressors, marine engines, trucks, tractors, arc welders.



Actual load test chart at left shows performance on Bosch type pump. Diesel generator is 3 cycle, 4 cyl., with 7½ KVA self-excited alternator. Note less than one-second response to load change.

SEND FOR BULLETIN FP-1217 for technical data and the name of your nearest distributor.

Precision Speed Controls Since 1862

Farris PICKERING GOVERNOR CO., INC.

400 COMMERCIAL AVE., PALISADES PARK, N. J.

TEXAS PLANT: 5405 CLINTON DR., HOUSTON 20

AFFILIATES: Farris Engineering Corp. • Farris Flexible Valve Corp. • Farris Engineering Ltd., London, England

Pipeline Building Booming —Future Looks Rosy For Gas Engines

With close to a $200-million plus natural gas pipeline building program in the works for a 20-state area, it looks like gas engine sales should slant sharply upward in coming months. Thumbing through recent Federal Power Commission reports clearly shows the boom is on. A brief rundown on some of the proposed pipeline construction activity follows:

Houston Texas Gas and Oil:
119-miles of pipeline with five new 4000-hp compressor stations for Florida.

Coastal Transmission Corporation:
80-miles of pipeline with three compressor stations in Texas and Louisi na of 2200, 1500 and 3,300-hp respectively.

El Paso Natural Gas Company:
394-mile pipeline from Utah to California-Nevada border to boost Los Angeles supplies.

Colorado-Interstate:
626-miles of pipeline; 9 new compressor stations totaling 45,980-hp; adding 32,600-hp to four existing stations.

American-Louisiana:
Two compressor stations, 8000 and 10,000-hp.

Algonquin Gas Transmission Co.:
Two 2000-hp compressors at Cromwell, Conn. and total of 9-miles of pipeline, near Mendon and Buzzards Bay, Mass.

TAXICAB OWNERS

INSTALL

Perkins

DIESEL ENGINES

WITH CONFIDENCE!

Perkins has sales and service facilities in 143 countries. For details on Perkins Diesel Engines for Taxicab conversion, write:

F. PERKINS (CANADA) LTD.
60 WINGOLD AVENUE, TORONTO 19, ONTARIO, CANADA
Ask for address of nearest Perkins sales depot in U.S.A.

Leased Diesel Generator Solves Utility's Peaking Problem

Leasing portable diesel generators is proving popular and profitable for Utah Power & Light Company. This company is renting equipment on a 12-month basis, finding it an extremely fast, convenient and economical way to firm up power demands in specific problem areas. Recently, UP &L installed a 1000-kw portable diesel-generator set at Vernal, Utah, leased from A. G. Schoonmaker Co., Inc., Sausalito, California.

Cat's US-Canadian Dealers See New Engines and Equipment

Caterpillar dealers from United States and Canada, represented by some 500 people, got a preview showing of the new '60 Cats, those already on the production line and some still in testing stages. New engines and earthmoving equipment reportedly "five years ahead of their time" were demonstrated at the company's research and proving grounds in the desert west of Phoenix, Arizona.

Chesebrough Chosen SAE Chief for 1960

Harry E. Chesebrough, vice President of Chrysler Corporation, has been elected President of SAE for 1960. He took over the reins at SAE's annual meeting in Detroit last month.

Mr. Chesebrough, who has been an SAE member for 18 years, is a familiar figure in the automotive world. During the last 25 years he has held jobs at Chrysler ranging from chief engineer-DeSoto Division . . . to chief body engineer . . . to general manager-Plymouth Division, a position he presently holds.

$4-Million Compressor Order Goes to Cooper-Bessemer

Ten turbocharged Cooper-Bessemer Type LSV-16-cyl engines driving Cooper-Bessemer type RFB-24 centrifugal compressors through speed increasers are slated for installation in Transwestern Pipe Line Company's 30-in. mainline gas pipeline running from Texas and Oklahoma fields to the California border. Sale will run well over $4-million. Important feature will be automatic control of whole mainline system. "Our engines and compressors linked with remote control is a combination that offers extreme flexibility and highest efficiencies known in pipeline operations today," stated E. L. Miller, Cooper-Bessemer president.

Associated Transport Buys 100 International Trucks

Associated Transport, one of the East Coast's largest haulers, is adding 100 International diesel-powered tractors to its fleet. This million-dollar order is part of AT's long-range expansion program. Joining AT's fleet of more than 4600 trucks and trailers will be 20 new International Model DC-405 cab-over-engine trailers with 80-in. sleeper cabs and 140-in. wheelbases, rated 68,000-lb gcw. Also 80 model BC-225-DL lightweight tractors with 90-in. cabs, 143-in. wheelbases. Both of these International tractors will be equipped with Cummins NH-220 engines, 5-speed overdrive transmissions and 2-speed rear axles. They'll be pulling 35 and 40-ft trailers for AT.

Perkins Turning Out 400 Engines Per Day—Plan 700 by 1961.

There will be a new Perkins engine rolling off the company's production line every 50 minutes, according to M. I. Prichard, managing director of F. Perkins Ltd. "Our peak production this year will be more than 400 engines a day. But this figure will rise to 700 engines a day next year," announced Mr. Prichard.

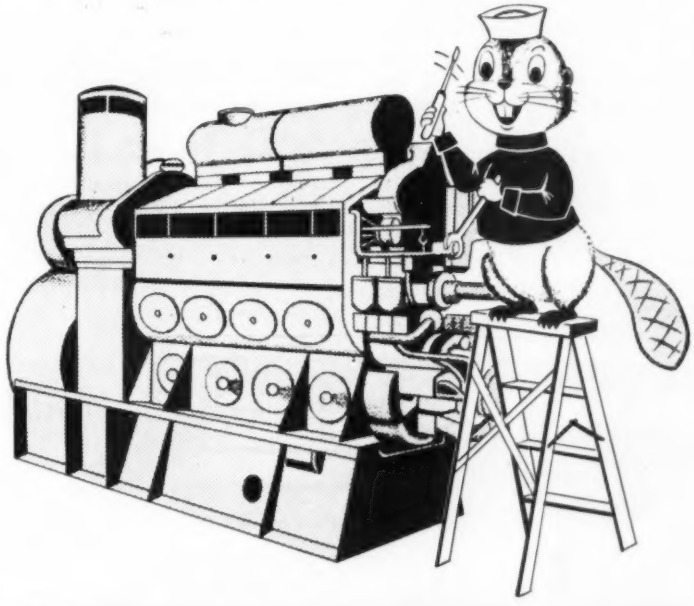
To keep up with a reported 45% increase in sales, Perkins is planning to add 80,000 sq ft of new floor space to their Eastfield, England, plant this year.

Kenworth Truck Company Gets Its Biggest Order —120 in All!

Dallas branch of Kenworth Truck Company received a welcome start for the new year—their largest single order of highway trucks. Customer is Chemical Express of Dallas, who ordered 120 Kenworth Model 922 conventional highway trucks that will feature Kenworth's unique tilting "unitglas" front end. Chemical Express expects to use the new truck to haul bulk cement throughout Texas.

Perfect Circle to Hold Hawaiian Maintenance Courses

50th state will be getting the low-down on "piston rings, pistons, cylinders and sleeves" this month when A. J. Weigand, Fleet Sales Engineer for Perfect Circle, conducts a series of 5-day maintenance courses in Honolulu, Oahu and Hilo. Also slated will be a series of refresher clinics for mechanics in the trucking, sugar cane and pineapple plantation industries. Sponsor is National Committee for Motor Fleet Supervisor.



SAVE TIME AND MONEY... LET NATIONAL MARINE KEEP YOUR DIESEL ENGINES, PUMPS AND COMPRESSORS ON THE JOB!

For annual maintenance and overhaul of your diesel engines, compressors and pumps, count on National Marine. We'll rush trained experts and replacement parts to the scene . . . by air, if necessary. You'll get urgently needed productive equipment back in service with a minimum of down-time, and yearly maintenance costs will stay at rock bottom. Call, write or wire for full information on our maintenance and repair service.

ENGINEERING SALES AND SERVICE DEPARTMENT
NATIONAL MARINE SERVICE, INC.
800 DELMAR AVENUE • HARTFORD, ILLINOIS
Telephone: (St. Louis) CHestnut 1-6358
General Offices: 21 West Street, New York 6, N. Y.
MEMBER OF THE AMERICAN WATERWAYS OPERATORS, INC.

diesel power news section people plants

Ingram Bros. Expands Service to Include Dallas Area

Bruce and Raymond Ingram, two fast-moving ADS members who already operate their Magneto & Diesel Injection Service centers in Corpus Christi and Houston, Texas, have branched out again. Last month they opened new offices and a plant to serve the Dallas area.

International Opens 4 New Offices

C. E. ("Skip") Jones, engine sales manager for International Harvester, announced the opening of four new regional sales offices to handle fast-climbing sales in I-H's construction equipment division. There'll be a new office in New York City; one in Melrose Park, Illinois; one in Dallas Texas; and another in Oakland, California. Assistant sales manager R. R. McKiel will be "Skip" Jones' right-hand man in the new 4-region sales set up.

R. A. D'Amour

Walter G. Fortune

Waukesha Appointments

R. A. D'Amour has been named assistant sales manager of the Waukesha Motor Company. With the company since 1952, Mr. D'Amour has been a midwestern sales engineer for the last seven years.

Frederick J. Gunther has been named product manager of Waukesha's Marine Engine and Public Works Division.

Jack Stewig has been named product manager of the CFR Division of Waukesha.

New Diesel Manager For Continental Coatings

Walter G. Fortune has been appointed diesel applications manager for Continental Coatings. Mr. Fortune's duties will include developing flame ceramic applications in the diesel field. Continental Coatings is the exclusive world-wide licensee for the flame ceramic process, used for coating piston-crown, cylinder heads and valves to increase part and lubricant life as well as save fuel.

For the past 15 years Mr. Fortune has been associated with diesel power applications in manufacturing, field engineering. operating and instructing.

Sealed Power Leases

With the leasing of a plant near Mexico City, Sealed Power Corp. forms a Mexican subsidiary, Sealed Power de Mexico, SA de CV. Manufacturing operations will begin in February or March.

KIENE® DIESEL PRESSURE INDICATOR

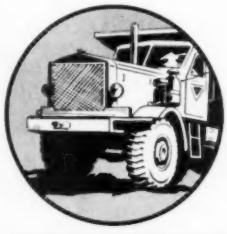
gives compression and firing pressures faster

SIMPLE
RELIABLE
COMPACT

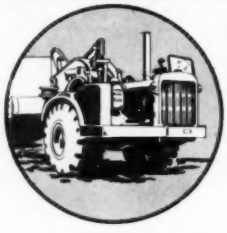
Send for Bulletin K-100

The Model K-100 Kiene Pressure Indicator accurately measures compression and firing pressures — assures the proper maintenance of diesel engines — helps prevent costly down time. Only one moving part — no friction or inertia effects — no complicated adjustments.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS



whatever the diesel-cleaning job, there's a LIX CLEANER



that will do it BETTER . . . FASTER . . . at LOWER COST!

LIX 22 Cleaner, for example, is ideal for cleaning heavy ROAD MACHINERY preparatory to painting. Spray Lix 22 on dirty, oily surfaces and see how quickly dirt and grease roll off. No brushing or rubbing is necessary. Simply rinse with water. Lix cuts cleaning time to a very minimum.

There's a Lix Diesel Cleaner for every purpose—spray, soak-tank, electric equipment cleaners.

Write or phone for literature covering your particular needs.

THE PRODUCTS OF RESEARCH Lix CORPORATION OF MISSOURI
300 W. 80TH STREET — DEPT. 30
KANSAS CITY, MISSOURI

Hartford Machine Screw Appointments

Fuel Injection Division of Hartford Machine Screw has announced the promotion of Jonathan F. Bushnell to manager for their mid-west region. Previously Mr. Bushnell worked on the development of the RoosaMaster fuel injection pump and was later in charge of assembly and testing operations. Since 1958 he has been sales and service engineer in the company's mid-west area.

William T. Lewis has been appointed sales and service representative in the Chicago area. He'll be handling customer contacts on all phases of RoosaMaster fuel injection pump equipment.

Snap-On Inaugurates New Sales Organization

Irving Johnson has been picked to head Snap-On Tool's new sales organization. Aimed at the sales and service of the company's larger more technical equipment, the new sales force will consist of factory-trained experts who will work on a nationwide basis, selling as well as training customers in correct operation of Snap-On Equipment. Special training classes, conducted by these factory-trained salesmen, will be held throughout the country to help solve special problems and familiarize customers with correct operating procedures. Johnson, who will be heading up the new program, has been with Snap-On for 26 years.

Appointments . . .

• American Air Filter has named Russell C. Taylor as Pacific Regional Manager, headquarters in San Francisco. Succeeding Taylor as manager of the Los Angeles branch office will be Charles J. Bressoud.

• George E. Slater has been named assistant chief engineer for liquid filter, and Harold R. Sobeck has been named assistant chief engineer for air filters at Air-Maze Corporation in Cleveland.

• Dressler M. Pruett has been transferred to Cooper-Bessemer's Tulsa office. Mr. Pruett will work as a sales engineer on the application and sales of C-B compressors and engines in that area.

• David K. Goff has been transferred to Cooper-Bessemer's Houston office where he'll be working as a sales engineer on C-B compressors and engines.

Jonathan F. Bushnell

William T. Lewis

Expansions . . .

• International Harvester is building a new motor truck parts depot at Fort Wayne, Indiana. This new central warehouse with 625,000-sq ft under one roof will receive, package, store parts and act as central supply for I-H's 12 parts depots.

Texaco Opens New Technical Services Office in Indiana

Texaco has just opened a new Technical Services office in Indianapolis that will make the company's research and technical service available to industries throughout Ohio, Kentucky, most of Indiana and southern Illinois. Brian Corrigan, former assistant to the manager of Texaco's central technical services division, has been named regional manager of the new Indianapolis office. Set up to help solve lubrication and fuel problems of all types, other offices in this nationwide technical service are located in Atlanta, Chicago, Los Angeles and Beacon, New York.

The World's Largest Manufacturers of

FUEL INJECTION EQUIPMENT

for Diesel Engines

Depots and Service Agents in over 100 countries.

C.A.V.

FUEL INJECTION EQUIPMENT DIVISION OF

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400 South Edgewood Avenue, Jacksonville, Florida

Canadian Distributors:
Joseph Lucas (Canada) Ltd. *Head Office:* 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Quebec

AP 930

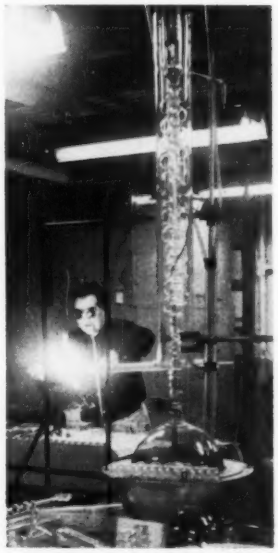
Here's the story of a barrel of lube oil, told largely with pictures. As a customer, what have you bought? You'll find that you are getting . . . .

More Than Just a Product

RESEARCH develops new products, solves lubrication problems . . .

Sample batch of a new product holds the interest of executives and engineers at Texaco's Research Center. A new lubricant for a specific application has resulted from the work of these men and the technicians at the Center.

▲ Let's say that the application for the new lube is in the automotive diesel field. The engineer in charge of the automotive engine section has followed the project through the Center's varied departments.



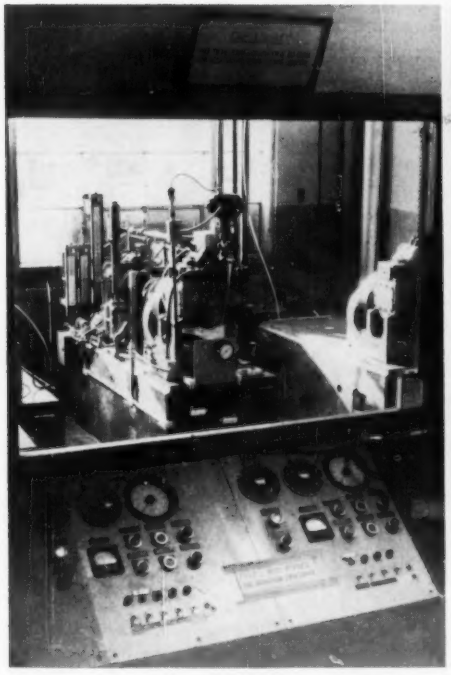
▲ It started with a basic problem—the need for a newly formulated lubricant to do a special job. Here in the glass department, components for a miniature pilot plant are made up to produce research batches for testing.

AS A CUSTOMER, you expect a good product when you buy. When it comes to lube oils this may not be enough. A product can be good but not necessarily for your particular application and service. You're not a lubrication engineer so what do you do?

This is what we asked Texaco Inc. Their answer was that the customer buys more than just a product, he buys a service, backed by some of the best technical minds and facilities in the business. We went to the Texaco Research Laboratories in Beacon, N. Y. to find out what this meant.

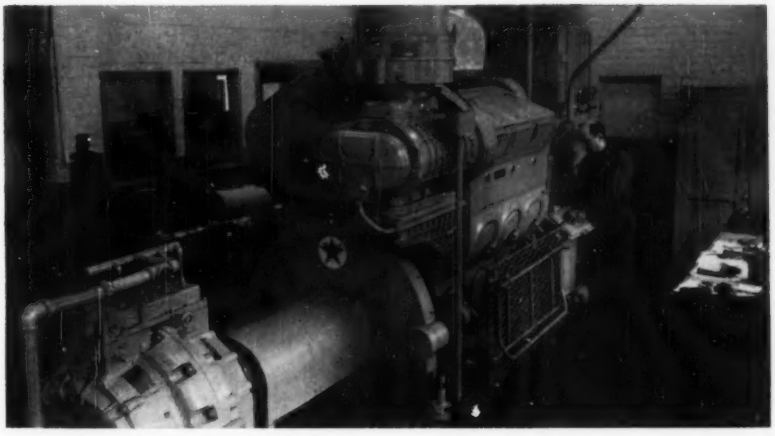
Facilities at Beacon have a dual responsibility: Coming up with new and improved products and backing up a field service organization developed to insure that these products are properly applied to do their job. Here's the setup. Texaco sells throughout the United States and hence has a comprehensive sales organization. Sales engineers, themselves, are no slouches when it comes to product recommendation and customer service.

Then there's the Technical Service Division, working parallel and in cooperation with the sales force. Their job is to stay on top of the technical end of the business. This could be solution of customer problems of a technical nature. Another job is to "anticipate". For example, they might spot a trend toward different operating conditions that might affect product requirement. New equipment, new engines, accessories and components, seen in field service might well tip off the engineer to the need for new or modified products.



New lubricant is tested in special engines which can be controlled to reflect desired conditions. CLR engine pictured, for example, permits comparison of oils under low temperature deposit formation conditions.

▲ Group engineer shows how deposit ratings are established as he checks one piston after a test engine run. New products are thoroughly evaluated in these various test engines, then go into a full scale engine test comparable to the actual application.



◀ Indicative of the range of the test facilities available at Texaco's Research Center to duplicate user equipment is this EMD 6-cyl locomotive engine, one of two heavy diesels at Beacon. Comprehensive test data has been obtained in the test engines and the new lube will now go into an actual field operation . . . Finally, into service for the user as a product tailored to his requirements.

Competent people with good product knowledge can solve a lot of problems right in the field. There are six technical service divisional offices, staffed with from one to six field engineers, ready to jump on the job. Two technical representatives, one in Detroit and one in Pittsburgh, service the important automotive and steel industries respectively.

When field problems get beyond the scope of field solution, or when detailed technical information is needed, it's back to Beacon for a complete rundown. Let's take a specific case.

Bearing trouble developed on some new stationary engines. Oil samples and some bearing shells were returned to Beacon. Here, they were routed to the technical service group. Oil samples would undergo chemical testing; bearings, physical tests. Beacon is always objective but it is nice to be able to exonerate the product. Here, they did.

Information at hand showed that these were a new type of bearing shell. Physical testing indicated a weakness in bearing design. A call to the engine manufacturer confirmed other complaints, information was exchanged, the bearing redesigned, and the trouble cleared up.

So the customer buys more than just a good product. He also buys a service. He gets interested, informed help in getting what he needs and applying it properly in terms of his engine and his operation. Then if he should run into trouble, he has the full technical resources of Texaco to call on to be sure he gets out of it.

RESEARCH backs up field service engineers . . .

Backing up the engineers in the field are the Center's extensive physical and chemical laboratories. Samples of fuels, lubes, greases and other petroleum products come in daily. Additionally, parts related to lubrication problems, such as bearings, gears, etc. are received. Through analysis of such parts it can be determined if the lubricant was adequate or if the part itself failed.

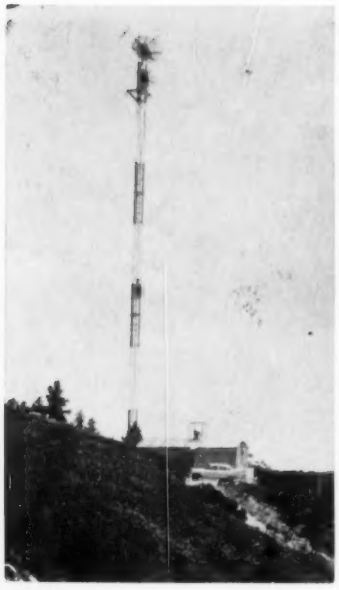
These may be new product samples returned for analysis after field tests or they may be samples related to a customer problem. They may even be a competitive product which will be tested to keep Texaco's research people posted on new developments. All samples are logged in here and routed to various departments for testing.

▲ Physical test facilities mean a broad range of specialized equipment. A section of a worn bearing is taken, polished and mounted. It is studied microscopically, photographed through special cameras. Metal fatigue, dirt—whatever the cause, the close study of such parts will tell the story.

▶

▲ Perhaps only a trace of contamination or a slight alteration in oil composition holds the key. Modern instruments make chemical analysis a quick and accurate procedure. Instruments such as the infrared spectrophotometer, the emission spectrograph and the X-ray diffractometer save an incalcuable amount of time over wet chemistry. An example of modern instrumentation is the Quantometer pictured. Sample is burned in the arcing device just behind the technician who is watching the results being automatically logged. Tests are programmed through control panel at right.

Modern research techniques do more than just guarantee the quality of today's wide range of petroleum products. They help solve problems which permit new designs and new applications for existing machinery. The user buys much more than just a barrel of oil, he buys a good chunk of technical progress. ▶



HOW TO RUN A PIPELINE HANDS OFF . . .

Small, remotely controlled diesels solve a tough problem economically by supplying power for five mountaintop microwave repeater stations . . . which in turn remotely operate a 650-mile crude oil pipline.

SUDDENLY AN ALARM BUZZER shattered the quiet in Shell Pipeline Corporation's control room at Compton, California. Somewhere along their 650-mile pipeline trouble was brewing.

Calmly, Shell's control room dispatcher walked to his giant panel. He checked a gauge . . . and then another one. The gauges told the story. Over the mountains hundreds of miles away, pressure was building up. Heavy crude oil flowing through a 16-in. pipe was threatening to break the line at Kingman, Arizona. A few more psi and the valuable pipe might go.

Quickly, the dispatcher dialed a 2-digit number, and waited. The message was flashed across the mountains along Shell's microwave communication network, from one microwave repeating station to the next. And, in seconds the dispatcher had his answer back.

Lights flashed on the panel, letting him know the exact depth of oil to the last foot and inch in the big Kingman relief tank. Yes, there was room—so he pressed a button to divert oil from the dangerously over-loaded pipeline into a giant 12-million gallon relief tank. It was all done remotely, expertly and efficiently, by a man many, many miles from the danger point. The emergency was over before it began.

Nordbergs operate without a man around . . .

Secret of Shell's unique pipeline monitoring operation is microwave. And heart of Shell's microwave miracle is a small 2-cyl Nordberg diesel engine. Power supplied by remotely-operated Nordberg diesels lets Shell's control room dispatcher operate pumping stations that push oil up steep mountainsides . . . lets him operate pressure relief stations such as the one at Kingman to keep the oil coming downhill at a safe psi.

Microwave 2-way radio communications lets him start, stop and route the oil coming from Southeastern Utah, lets him open and close valves all along the 650-mile pipeline. But, without the services of these 10 small diesels located high on lonely mountaintops, there would be no microwave. Diesel power was picked to do this difficult job for two very sound reasons. First of all, because diesel offered the necessary versatility and proven reliability. Secondly, the ease with which diesel can be "married" to modern remote control systems.

The amazing microwave system by which all this remote control is possible consists of seven communications terminals and eight repeater stations. But five microwave repeating stations are in such isolated areas that the tapping of public lines was out of the question. Although only four kilowatts are normally required to run a repeater station, it is essential to have this power and have it at all time. Power for these five isolated stations is provided by 10 Nordberg diesel-electric generator sets—two engines at each site. One in use, one standby.

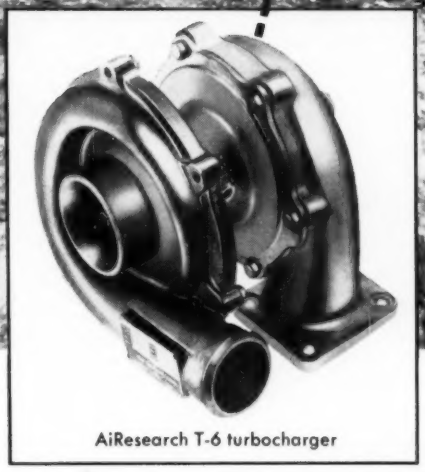
These standby diesels can be checked out remotely by a technician back at Compton, California, hundreds of miles away. For example, to exercise the standby engine on Butler Peak, 76 miles away, a technician dials 29, code for Butler, followed by 47, code for an automatic switch to start the standby engine. Or, by dialing 29 in combination with a long checkoff list of other 2-digit code numbers, other vital functions can be tested at the Butler repeater station.

Installation on a mountain top . . .

These diesel installations operate at 8000 to 9000-ft altitudes where loss of power is considerable. Plus this, these locations experience rapid temperature changes from day to night with widely separated extremes from summer to winter. Another installation factor was the necessity for having engines that would operate in such a manner that they would not adversely effect the delicate microwave equipment which shares the building with them. And, of course, the diesels are unmanned, remotely controlled, and must run for weeks, possibly even months—between service visits.

(*Continued on page* 30)

AIRESEARCH ECONOMICALLY TURBOCHARGES SMALL TRACTORS



AiResearch T-6 turbocharger

International Harvester's TD-9 shows 18 percent more torque rise

AiResearch's small T-6 turbocharger now enables the 282 cu. in. engine on International Harvester's new TD-9 crawler to develop a torque equal to a naturally aspirated engine 25 percent larger in displacement. This low cost turbocharger substantially reduces the unit cost of small tractors operating at this power level.

Boosting this small block engine to 71 horsepower and greatly increasing its versatility, the above pictured T-6 model also provides up to 10 percent better fuel economy.

Weighing 24 lbs. and measuring 7¾ in. in diameter, the T-6 is one in a complete line of AiResearch turbochargers which makes the turbocharging of small diesel engines economically desirable.

AiResearch is a world leader in the development and production of air-cooled turbochargers and turbocharger controls for all major diesel engine applications. Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

Diesels Run, Hands Off . . .

(*Continued from page 28*)

Engine room and microwave equipment room occupy opposite ends of an insulated sheet-metal building. Air for the engine room is drawn into the entry room through a cupola in the roof and thence through a 4850-cfm oil-bath air filter, built into the engine room wall. Designers of the microwave system wanted to eliminate all chance that the automatic switches and engine alarms could become fouled by dust. Engine air is filtered again by oil-bath cleaners on the engines.

The engine fan blows outward through the radiator into a duct which vents through the back wall of the building. If the temperature in the engine room falls below 80 degrees, an automatic device open shutters in the sides of the duct and closes the louvers to the outside so the warm air will stay in the room.

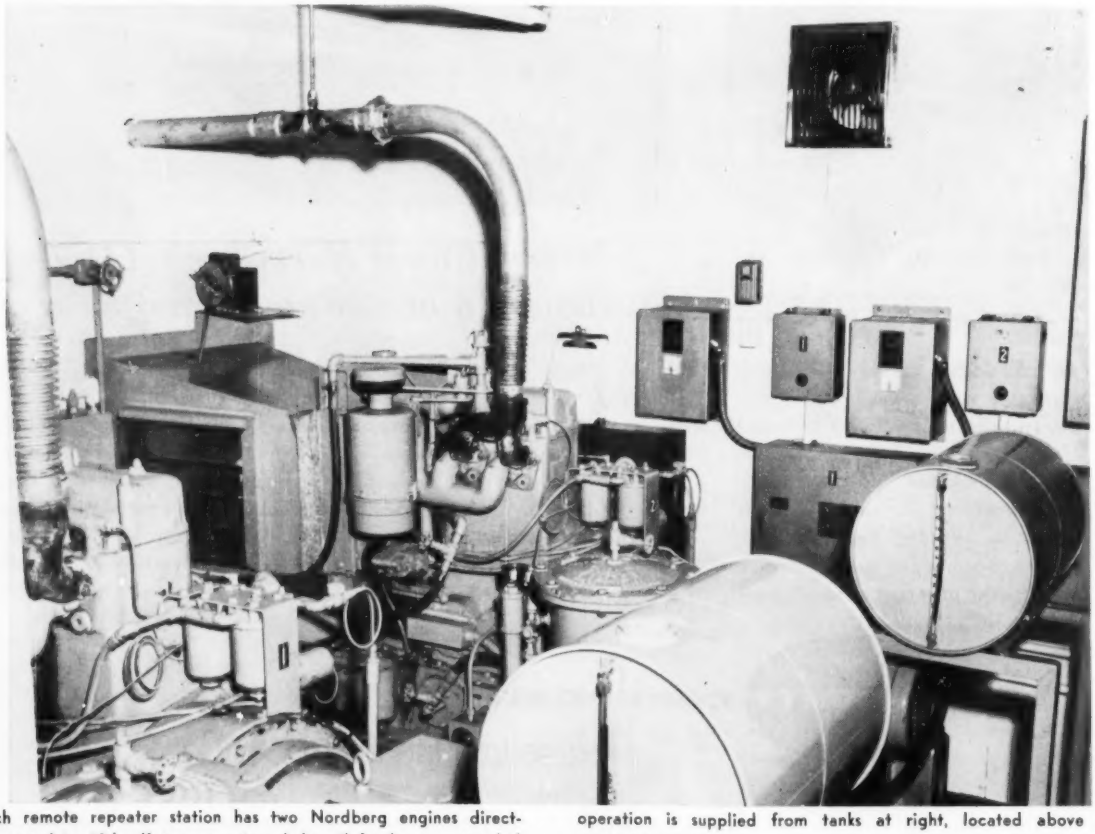
There are two 2500-gal fuel storage tanks behind the building. Although No. 2 diesel fuel is recommended for Nordberg Power Chief engines, the mechanic in charge of the pipe line's six Nordbergs located in California is using No. 1 diesel fuel as he feels this contributes to quick, easy starting in case an engine casualty requires automatic starting of the standby unit.

Even though the engines operate under adverse conditions at high altitude, using only 12 of the rated 20 hp (a portion of the load is created by strip heaters secured to the outside of the building) and burning No. 1 fuel oil, fuel consumption averages only five pints per hour.

Repeater station outside wall has strip heater that induces artificial engine load. Fuel tanks have 5000-gal capacity.

Because of infrequency of service for filter elements, a 10-gal capacity industrial-type oil filter has been connected to each engine. This is in addition to the filter supplied with the engine. Small drums have been mounted above the engines to assure a continuous supply of lube oil.

The engine cooling system is filled with a 75% permanent-type anti-freeze solution. The Shell Pipe Line mechanic does not believe the operation requires a water



Each remote repeater station has two Nordberg engines direct-connected to 10-kw Kato generators. Lube oil for long unattended operation is supplied from tanks at right, located above the generators.

filter or an anti-corrosive additive. His maintenance schedule calls for draining and flushing the cooling system once a year. A small heat exchanger is installed between the two engines for the purpose of keeping the jacket water in the standby engine warm at all times.

Since temperature in the engine room is kept fairly constant at around 80°F, there is no need to warm the oil in the standby engine. The Nordbergs are equipped with electric starters and 12-volt storage batteries. There is an extra battery at each diesel-powered repeater station. Also each station is equipped with a battery charger and hook-up to keep all batteries at full strength.

Automatic switching gear provides for stopping one engine and starting the other in case the operating engine registers high temperature, low oil pressure, or other malfunctioning. The start and stop switches also can be selectively operated over the microwave system.

Is it paying off?

There's no question about it! Putting these small diesel-electric engines to work helped Shell solve a difficult problem—a problem that couldn't be solved in any other way. What's more, the job is being done *economically*—and economy is mighty important to Shell's operation. Of course, there was an alternative to Shell's unmanned, remotely controlled diesel operation. But, price-wise, it would have been completely out of the question. . . . Five men permanently sitting on a mountain top can run into money, a lot of money. And besides, where would you find five men willing to do *that* kind of job?

Shell's microwave-controlled pipeline is an extremely interesting application of diesel power. When imaginative engineering couples modern control systems to a versatile power plant the opportunities, it seems, are practically unlimited.

PRINCIPAL EQUIPMENT AT EACH MICROWAVE STATION

Engines (2)	Nordberg Power Chief, Model 4FS2 2-cyl, 4-cycle, rated 20 hp at 1200 rpm
Generators	Kato, Model 49MHS6, Type 5073 AC 10-kw, 12.5-kva, 115/230 volt, 108.6/54.3-amps, 60-cycle, 1200 rpm, single-phase, 4-wire, PF80
Exciters	Kato, DC 500-watt, 6.6-amp, 75-volt
Building air filter	American Air Filter, Model B, oil-bath, 11,690 cfm
Air intake filter, engines	Vortox
Lube oil filter	Fram, by-pass type
Lube oil filter (added)	Winslow, Model 4-1654D, heavy duty 10-gal (installed because of long periods between service visits)
Fuel transfer pump	Viking, rotary, 3 gpm
Automatic switch gear	Automatic Switch Co.
Spark arrestor-muffler	Burgess-Manning
Starter	Autolite
Batteries	Goodyear, 12-volt
Battery chargers	LaMarche Mfg. Co. (Constavolt) Model AB-1012W, 115-volt, 5 amps, 50-60 cycle, single-phase

A Reliance INSTRUMENTS TACHOMETER ON YOUR ENGINE IS THE BEST PROTECTION YOU CAN HAVE

When you see a Reliance Tachometer on any diesel engine you can be sure there's nothing better to give you the most accurate speed measurements in R. P. M.'S. Only Reliance can bring you accuracy to within ½% . . . the durability and ruggedness to withstand the stress and vibrations of heavy duty equipment. Since 1909, Reliance Tachometers, Adapters, Clutches and Flexible Shafts have stood for quality . . . have proven tops in the field of fine instruments. Send for your free catalog and find out for yourself.

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Today's Diesel Man

"There's nothing easy about strip-mining. It's a tough round-the-clock job . . . one that beats down the best of equipment. That's why one of the key persons in making our operation feasible and profitable is Harry Miller, our diesel man. Maintenance is his speciality—in the shop and trouble-shooting out in the field."

Dean Rhodes, President
Stahlman Coal Co.
Corsica, Pa.

Stahlman Coal's diesel Man, Harry Miller, Checks a job. done on a big International dozer, one of several used.

story and pictures by Walter Rudolph

IF YOU'VE tracked down a diesel man in construction work and again in strip-mining, you'll find the two in surprisingly similar circumstances—hot, sweaty and dusty in warm weather . . . wet muddy and miserable in the rain . . . cold, numb and chattering in sub-freezing February weather.

Earlier this month we found Harry Miller, diesel man for the Stahlman Coal Company of Corsica, Pennsylvania, busy directing and helping tear down the drive on a big dozer right where she sat, out in the field.

We'd been driven out to the spot by Dean Rhodes, president of the Stahlman firm. The puddles were skimmed with ice and there was a definite threat of snow from a gray Pennsylvania sky.

"Harry Miller's job calls for a mixture of ingenuity and knowhow," Dean Rhodes told us as we watched the men work. "And, as you can see, our diesel man needs an old-fashioned kind of grit that tackles any job anywhere, anytime . . . even when the breeze blowing in his face is 25 degrees above zero."

Harry Miller had his hands full with the dozer drive. So we asked Dean Rhodes most of our questions. Harry, he told us, came out of the service in 1948 with a real interest in engines, happy only with a wrench in his hand and a little grease under his fingernails.

Working on diesels for Stahlman Coal Company was Harry's first job out of the service. And he's been with them ever since. Dean Rhodes smiled, shaking his head. "Harry Miller is the man who came to work on diesels—and stayed and *stayed*. He really learned diesel maintenance from the ground up with us."

The Stahlman operation, Rhodes explained, maintains a repair and spare parts shop near the center of their 11 mile-radius strip mining activity. Major repair and rebuilding work such as Harry was supervising is usually done back at the shop . . . this was an emergency.

Stahlman uses diesel machinery to strip mine and market approximately 500,000 tons of bituminous coal every year. After it's stripped, the coal is trucked to a railroad tipple where it's cleaned, sorted and washed before being loaded on freight cars.

Dean Rhodes stamped his feet and shoved cold hands deeper into his pockets. Harry Miller and his helpers worked on, seemingly oblivious to temperature. "Ours is a small, tightly knit operation here at Stahlman. We've got some 60 men or more in the pits. The bulk of our diesel equipment is pretty well known to Miller. In fact, you might say he knows them all—Page draglines, Manitowoc's, Lorains, Euclid's and Internationals—knows them as well as the back of his hands.

"This is a big help in keeping 'em running right. Also, he's able to keep his preventive maintenance system simple and effective. He's boiled down the clerical work to bare essentials . . . just enough to know what's due when. And he sees that it's done. With a fairly small equipment inventory it's awfully easy to go overboard on an elaborate system with a lot of records to keep. No system, maintenance costs will kill you; to much system, the costs go up too. We think we have a happy balance for our particular operation."

We said goodby to busy Harry Miller and walked back to the pickup. "Harry helps us get longer life out of our diesel equipment," Rhodes said, starting the pickup's motor and switching on the heater immediately. "And keeping downtime to a minimum is vital and important when you consider we operate two 10-hour shifts daily, 120 hours every week."

Dean Rhodes told us he was especially proud of the way Miller works long hours to help keep the diesel equipment

Two-way radio ties together diesel-powered units in 11-mile radius. Equipment is moved quickly . . . necessary maintenance is taken care of immediately.

Emergency breakdown in this tough service gets immediate on-the-spot correction. Dean Rhodes is at far right, next to his diesel man Harry Miller.

at peak operating efficiency. With Stahlman Coal running on a 120-hour work week schedule, Miller quite often not only does his 10-hour daily stretch, but more than likely is liable to wind up with 15 to 18 hours in a work day.

"When Miller comes to work in the morning," continued Rhodes, "he follows a regular routine to keep our operation going smoothly. When there isn't trouble to take care of, like a broken drive shaft or worn out water pump, Harry does his periodic preventive maintenance and check-up work on our diesel equipment. Eighteen pieces of diesel equipment in all keep him pretty busy".

We were out on the smooth highway again and the heater was just beginning to throw some heat. Rhodes lit a cigaret. "These eighteen pieces of equipment give us quite a chunk of diesel power," he said. "Maybe we're a relatively small operation compared to some of the big construction outfits. But we do a whale of a job, *and under extremely hard working conditions.* Economy of operations, without question, is the biggest factor in our decision to use diesel-powered equipment *wherever* and *whenever* we can. What we buy has to be good."

We also lit a cigaret. And after a moment or two had passed, asked Dean Rhodes the touchy question—who buys?

"Harry Miller and I do the buying *together*," Rhodes indicated, smiling. "Harry recommends this or that make and gives his opinion on parts replacement. The final decision is a joint one, I would say."

What about the future of strip-mining? Well, Rhodes was optimistic—he looks forward to successful operation of the business for years and years to come. Diesel power, he believes, will continue to play an irreplaceable role in this type of industry because "it's the only kind of power that affords economy for brutal, hour-after-hour work."

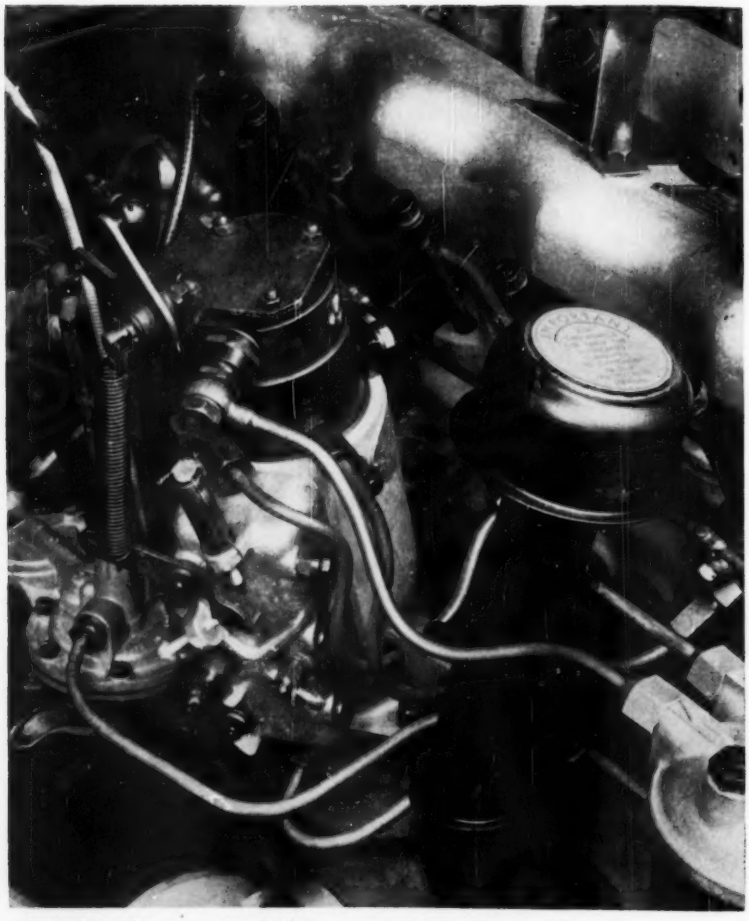
"A while back," Rhodes pointed out, "there was some attempt to put electrical power to work at our particular type of operation. But they lost money. Diesel power is our best bet in the long run."

Strip mining is a tough, round-the-clock operation. There's a wide variety of diesel equipment used, all heavy duty.

C.A.V.'s Distributor-Type Fuel Injection Pump

DPA

. . . . here is a report on a pump you will be seeing on a number of imported engines. The "DPA" is C.A.V.'s version of the RoosaMaster "A" pump developed under license for use on a number of British and European engines.



DPA fuel injection pump in a shank-mounted application. Drive is taken from the engine's camshaft through skew gears. This type of drive is particularly useful on small engines where space along the block and room for a pump drive is limited. Accessibility is excellent; lines to injectors of minimum length. Note simple throttle linkage.

JUST after World War II the British diesel industry began searching for ways to bring the advantages of the diesel to lighter vehicles. C.A.V., British manufacturer of fuel injection and electrical equipment contributed to the success story of the diesel in this application by finding a way to reduce the cost of fuel injection equipment.

The cost of injection equipment then in use was much too high in proportion to the overall cost of smaller engines. Simplified design seemed to be the answer. Realizing the limits of what could be done with the multi-plunger type pump, C.A.V. turned its attention to the distributor type. After several years of research and development they decided to review their own designs and others in the field. At this point the Roosa-Master "A" pump came under consideration.

This pump, with its basically simple design, its ability to be run at high speeds, plus other advantages, seemed ideal as a solution to C.A.V.'s cost problem and an agreement was worked out with the Hartford Machine Screw Co., maker of the Roosa-Master pump. C.A.V., after further development work, soon went into production of their DPA pump.

(*Continued on page* 36)

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(*Continued from page 34*)

DPA Features and Advantages . . .

In addition to its design which allowed production within the cost limits, the DPA pump has further advantages to its credit. For one thing its size makes it ideal for mounting on small engines. It can be mounted vertically, horizontally, or in any position. This is a real bonus in light vehicle application where space around the engine is at a premium.

Like the Roosa-Master "A" pump, the DPA is a single cylinder, inlet metering, opposed plunger distributor type pump. With the governor, it forms an oil-tight unit with relatively few moving parts. Lubrication is provided by filtered fuel oil. The same pump is applicable to engines, in the small size range, regardless of the number of cylinders.

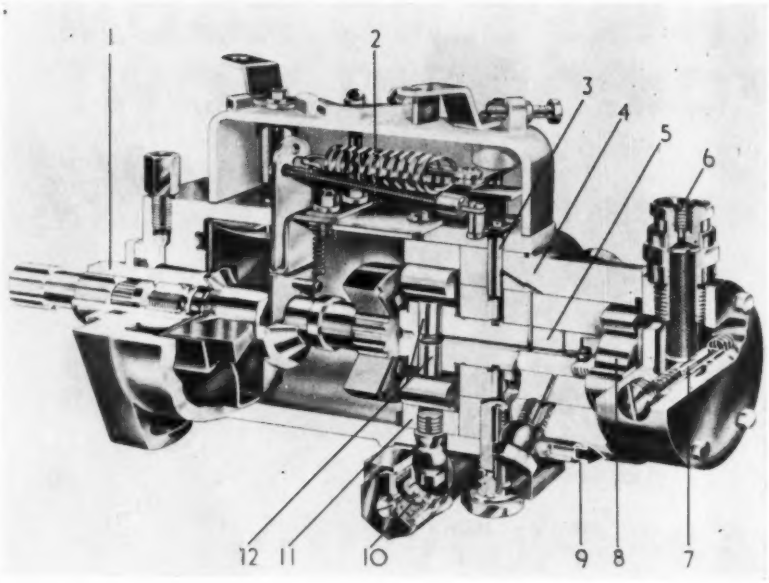
The DPA pump requires no calibration. Equal fuel delivery to each injector is a built-in feature. Fuel flow during the suction and discharge strokes is shown.

150,000 strong . . .

C.A.V.'s engineers invested a good deal of time in perfecting and testing the DPA. It does the job, opening the way to higher operating speeds, smaller engines in both size and weight for a given power output. The invasion of the light vehicle field by the British diesel industry is an accomplished fact. The DPA pump is in service on diesel engines in farm tractors, buses, light trucks, taxis and in private cars throughout England.

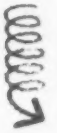
In production since 1956, more than 150,000 units are currently in use. This is the best indicator of the value and quality of this pump.

More recently, Hartford Machine Screw has worked out an agreement with C.A.V. and the D.B.A. (Ducellier for automotive electrical equipment, Bendix for all types of vehicle brakes and Air Equipment for manufacture of aircraft fuel systems and electrical equipment.) They have formed a new manufacturing group Roto Diesel S.A. with a new factory in Blois on the Loire, France.



C.A.V.'s "DPA" is very similar to RoosaMaster's "A" pump. Drive (at 1) turns governor and rotor (5) in hydraulic head (4) that, in turn, drives transfer pump (8). Fuel enters through inlet (6). Regulating valve (7) holds pump output pressure constant and fuel flows through a passage in the hydraulic head, through the annulus in the rotor to metering valve (3). It then flows through passages (when in index) to the rotor's central bore and the pumping chamber between high-pressure plungers (12). As the rotor turns, inlet passages are blocked and cam ring (11) squeezes the plungers together. High-pressure fuel flows back through the bore to an outlet passage near its end. This will now be in index with a discharge outlet (9). Injection advance can be obtained by moving the cam ring with a hydraulic device (10). Tension of spring (2), set by throttle position, opposes centrifugal force of governor flyweights. Through the linkage, the metering valve is turned to vary the orifice and admit the proper amount of fuel to the pumping chamber.

Plant size, machinery and conveyers give indication of C.A.V.'s production.

If it rolls on an axle or turns in a bearing or rides on a shaft if it slides in a groove or moves on a pivot if it bores  or cuts or transmits pressure

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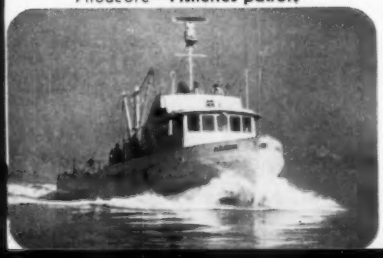

D. F. Finlayson, B.S.
U. S. Merchant Marine Academy
Engineering—Applications

WRITE FOR DESCRIPTIVE LITERATURE

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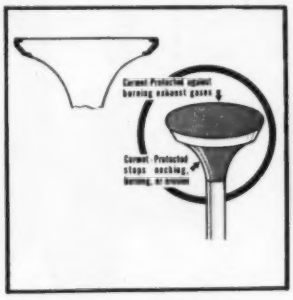
WAUKESHA, WISCONSIN
New York • Tulsa • Los Angeles
Factories: Waukesha, Wisconsin, and Clinton, Iowa

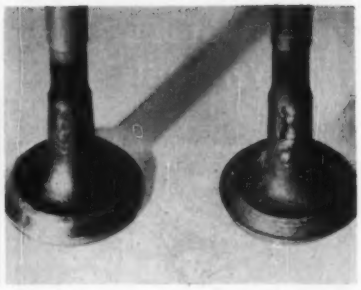
EXCEPTIONAL PLANT FACILITIES
25 ACRES OF MANUFACTURING SPACE

Extra Protection for Engine Valves

Spray-applied metallic powder provides refractory coating to stop burning, erosion and necking of valves

by Harry Zesky, President
Republic Hardfacing Corporation





Drawing shows conventional hardfacing application. Cermet valve at right has extra protection in shaded areas. Photo shows how standard hardfaced valve at right "puddled" in 30 seconds under acetylene torch torture test. After 55 seconds base metal of Cermet valve at right started to fall away by Cermet material maintained its bond to the base metal.

ENGINE valves face three enemies—wear, heat and corrosion. Hardfacing has been effective in reducing wear when applied to both new and rebuilt valves. Now, a relatively new method of hardfacing promises to provide excellent protection against burning and corrosion. It, too, applies to both new and rebuilt valves.

A metallic powder known as Cermet is spray-welded on the valve head and around on the neck. Heat and corrosion resistance of this factory material is so effective that it is used extensively in the jet engine field. This same sort of protection is particularly needed in applications such as truck diesels where rapid heating and cooling eats and warps the valves.

First, hardfacing . . .

Conventional hardfacing of diesel valves has, of course, provided very satisfactory results in the past few years. It is done by the oxy-acetylene process for (1) close heat control and (2) soundness. Arc welding is far too hot for valve seat welding because there is too little metal to draw away the heat. Gas welding, however, gives a soft, easy heat control that results in a smooth, dense deposit.

Here's how a diesel valve is rebuilt with conventional hardfacing. First, the valve is grit-blasted to remove carbon and dirt. Next, the valve is undercut in a lathe to insure an alloy layer of the right depth. Then the valve is power-rotated in a device that tilts it for downhand welding. It usually takes two passes.

With valve head rotation controlled by a foot switch, the operator preheats the head in the seat area and then applies the hard layer. A common material used is Stoody No. 6, a cast ¼-in. filler rod containing tungsten, cobalt and chromium for good heat and impact resistance.

Immediately after welding, the valve head is plunged into a tote box full of vermiculite to retard cooling. We've found that vermiculite won't adhere to the hot part and is clean to work with. After cooling, the valve is ground to very close tolerances.

This method of hard facing is excellent for rebuilding worn valves in large or stationary diesels. Actual experience in oil-field, marine and locomotive engines shows that they can give from three to five times the performance life of the original non-faced valve. Cost is only about 50% of a new valve.

Cermet gives extra protection . . .

Although this type of hardfacing is satisfactory for most cases, there are many applications in which exhaust valves have a tendency to burn and erode on head areas and directly below the seat at the neck area. High exhaust temperatures and variable loads and speeds accentuate the condition.

Taking a page from jet engine technology in the field of protecting parts exposed to extremely high temperature gases, we develop a new process for applying a coating to the valves. A metallic powder is spray welded to the valve head and neck, both areas particularly vulnerable to the high-temperature exhaust gases. The spray-welded application creates a positive fusion bond to the parent metal. The coating has been very effective.

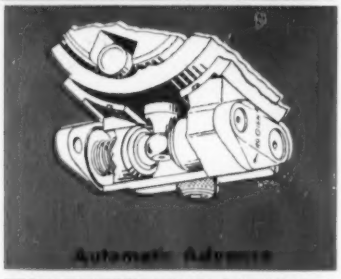
Burning action or erosion of the parent metal adjacent to our hardfaced surfaces, and any tendency for necking, is eliminated. Field tests in the toughest service have indicated that a new standard for valve life has been set.

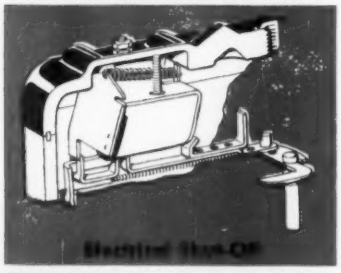
Conclusion . . .

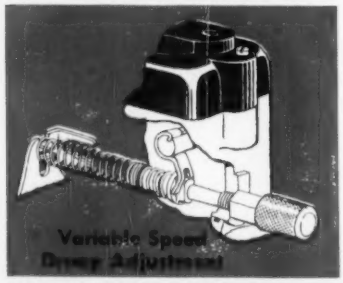
Users expect more from today's engines in terms of both power and life. Also, costs are becoming more and more critical. As engine outputs go up, so do temperatures and if engine components are to cope with these for long periods and without excessive costs, advantage must be taken of every new technological development.

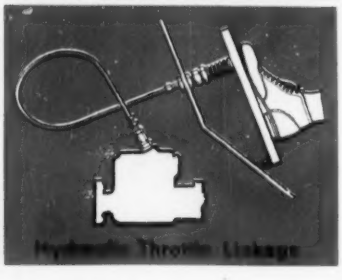
Application of Cermet to valves is a good example. The protection it affords is typical of the refractory materials developed for jet engines, missiles and rocketry. Other uses are being tested, for example, as a coating for aluminum pistons. Tests look promising and in the meantime, this process for extra protection of both new and rebuilt engine valves is proving its value daily.

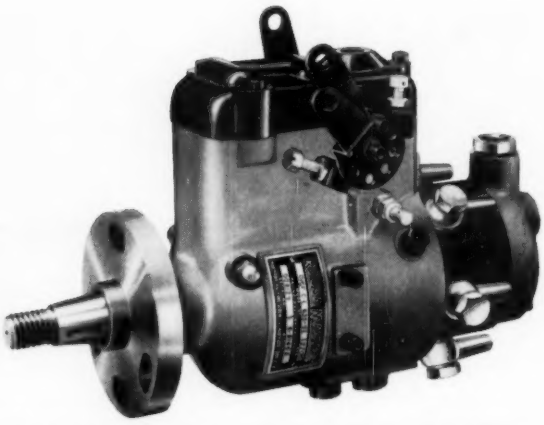
A few accessories that add versatility:











ROOSA MASTER

Most Versatile
FUEL INJECTION PUMP

Diesel engine manufacturers, their designers and engineers are specifying ROOSA MASTER because they know that it is the most versatile. There are many reasons for selecting this pump. Here are just a few:

- **VERSATILE** because of the variety of built-in, space saving, accessories demanded by modern diesel engine design. Roosa Master can provide more compact, lower cost, complete units to meet many different applications.
- **VERSATILE** because only one size pump serves either a 2, 3, 4, 6, or 8 cylinder, 2 or 4 cycle, small or large displacement engine . . . and only Roosa Master can be mounted vertically or horizontally.
- **VERSATILE** because it is applicable to automotive, construction, farm, generator, marine and stationary equipment guaranteeing dependable, economical service. Write for further information.

HMS ROOSA MASTER makes good diesels better

Member

HARTFORD MACHINE SCREW CO., HARTFORD 2, CONN.
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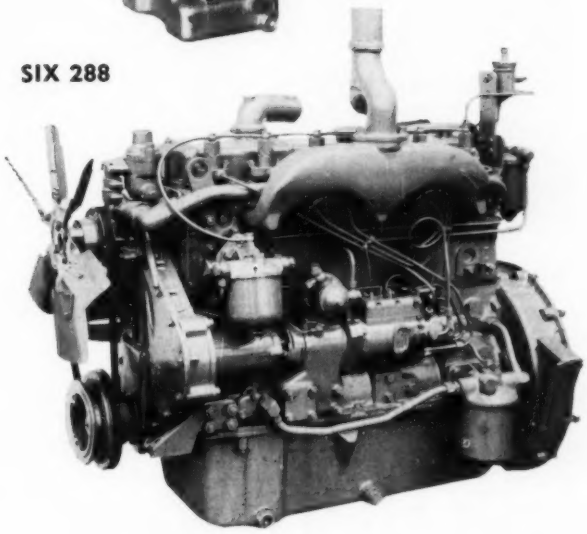
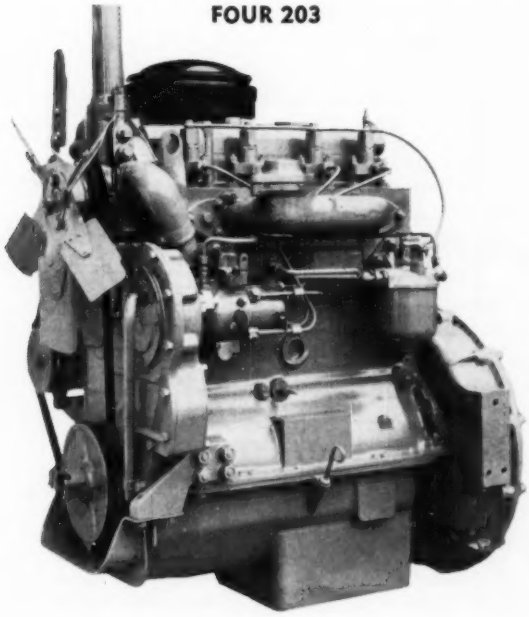
SIX 305



SIX 288



FOUR 203

3 new engines from Perkins...

for medium-range trucks; agricultural equipment; industrial application

PERKINS Engines Ltd. is offering three new engines aimed at three different applications. The Six 305 is for vehicular application. The Six 288 (TA) engine is aimed at self-propelled agricultural equipment and the Four 203 is an industrial engine for use in fork lifts, mobile cranes and a wide variety of industrial applications.

More power and long life are the key sales points Perkins is talking about for these new engines. About to go into full scale production in England, prototypes are available now for manufacturers. Let's take the vehicular engine first.

Six 305 for medium-range trucks . . .

Specially designed for medium-range trucks, this is a new 6-cyl, vertical, in-line engine rated 89 bhp at 2600 rpm maximum. Its maximum torque is 218 ft/lbs is 1250-1500 rpm. Bore and stroke is 3.6 x 5 in. and the cubic capacity is 305.3 in.

Greatly reduced bore wear, one of the extra-life features claimed, is insured through the use of chrome-plated, thin-wall cylinder liners.

The C.A.V. DPA fuel injection pump is also cited as a longevity factor. With its accurate metering characteristics, minimum working parts and integral governor it promises long and efficient operation with a minimum of service. The pump is flange-mounted, and on this engine, has a hydraulic governor.

Pressure lubrication is provided for the engine by a rotor-type pump driven through a vertical shaft by skew gears from the auxiliary drive.

Common to all of these new engines is the Perkins combustion system, a combination of both direct and indirect injection. The combustion chambers are spherical being formed half in the head and half by detachable steel caps located on the fuel pump side. The injectors are easily accessible. Each injector emits two sprays, one di-

rected to the combustion chamber and the other into the cylinder itself.

Other features worth noting include pressure lubrication for auxiliary-driven equipment from a distribution point on the auxiliary drive housing. The 7-bearing crankshaft's rear main journal is burnish-rolled on the fillet radius, increasing fatigue strength. Uniform distribution of cooling water is insured by a water manifold fitted along the combustion face of the cylinder head.

Six 288 agricultural engine . . .

This entry is designed for larger self-propelled agricultural equipment and has a number of excellent points for this service. Many of its features are similar to the Six 305. Here are some of the Six 288's outstanding points, starting off with basic specs.

It is a 6-cyl, vertical, in-line engine rated 76 bhp at 2000 rpm. Maximum torque is 207 ft/lb at 1400 rpm. Bore is 3.5-in. and the stroke is 5 in. Cubic capacity is 288.6 in.

Accurate speed control, a real must in applications such as combines where constant drum speed is required, is obtained through a mechanical governor which is integral in the C.A.V. fuel pump.

The Six 288 is equipped with dry, pressed-in cylinder liners. Cold weather starting is made easier through the use of a 12-v Thermostart heater (C.A.V.) in the intake manifold. This engine also has many of the "long-life" features described for the Six 305.

Four 203 for, long life and economy . . .

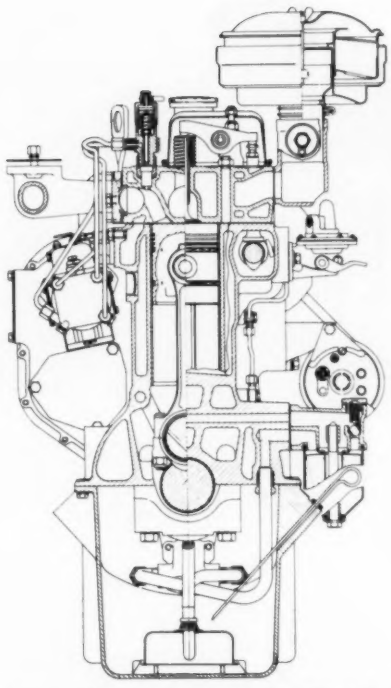
A 4-cyl addition to the extensive Perkin's line, this is a 60 bhp at 2400 rpm industrial diesel, ideal for such applications as fork-lifts and mobile cranes. It boasts a high power to weight ratio, developing up to 47 bhp at 2000 rpm for continuous operation. Control is by mechanical governor. A hydraulic governor is also available.

An important feature of this engine is the manner in which Perkin's engineers have met auxiliary power take-off requirements. Power take-off is possible from two points. A geared drive provides accurate timing and smooth running conditions. A hydraulic pump, with a capacity of up to 17 gpm at 1700 psi, may be mounted to drive off the camshaft gear. It can also be mounted beneath the fuel pump. This is particularly useful for power-assisted steering.

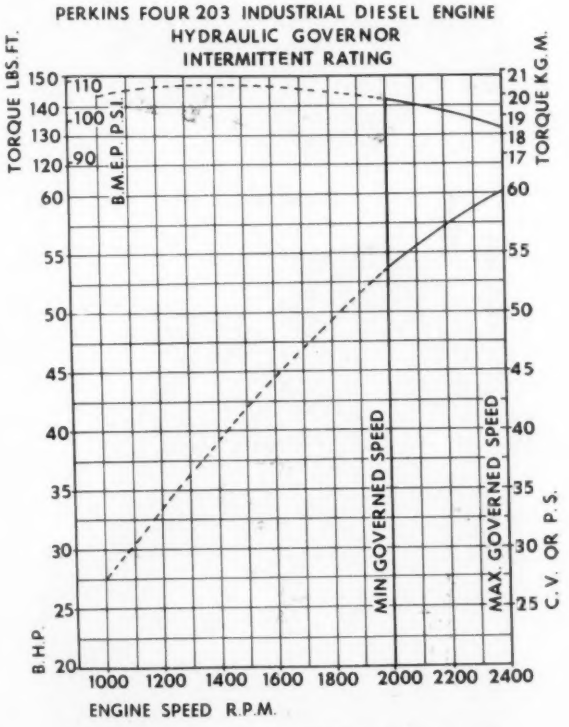
The Four 203 has a 3.6 in. bore, a 5-in. stroke and 203.5 cu in. capacity. An almost identical version of this engine, called the Four-192 is also being offered. This engine has a smaller bore, 3.5 in. and is rated 45 bhp at 2000 rpm, continuous. Its rating for intermittent use is 58 bhp at 2400 rpm. Both engines are available with various accessory equipment for different applications all the way up to a complete industrial power set.

A broader range . . .

These additions to the Perkin's line of diesels further broadens the range of engines made by this English manufacturer. Probably the world's largest producer of diesels, they have extended their sales facilities throughout many parts of the world. Perkin's engines are making strong in-roads in the American taxi market and in other applications. These new engines will undoubtedly maintain the quality and durability already proven by other models.

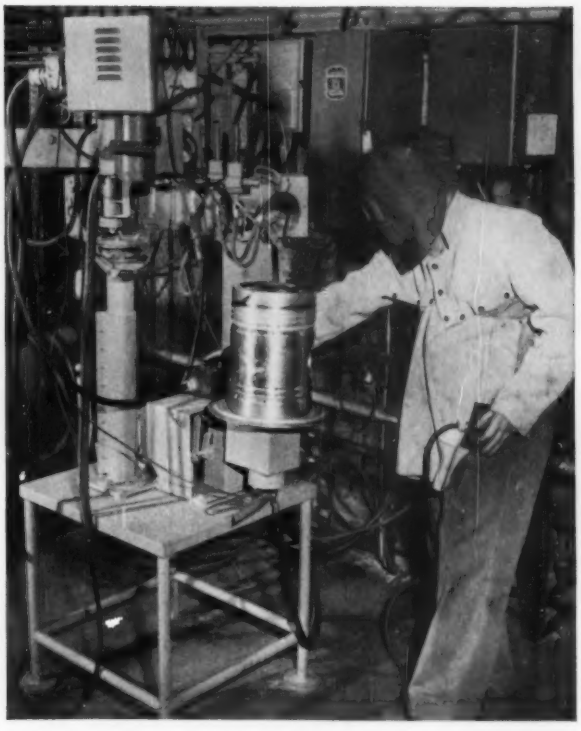


Transverse view of Perkins FOUR 203 industrial diesel. Construction is typical of the SIX 305 and 288. Note pre-combustion chamber detail.



Performance curves for the FOUR 203—again, once allowance is made for hp differences, the curves are quite typical of the other two engines.

1. Pistons with Ni-Resist inserts in the top ring grooves... where heat, wear and acid attack is highest... are original equipment in 9 x 10½-inch Alco Products engines.



2. To reclaim worn pistons for users, Alco machines down the ring carrier then shrinks and welds on a new carrier, also equipped with Ni-Resist inserts.

Two things Alco does to put heavy-duty aluminum piston life into the million-mile class

Several years ago, ALCO Products, Inc., a leading builder of diesel locomotives and engines, adopted as standard Ni-Resist* nickel-chromium cast iron inserts for the top ring groove of oil-cooled pistons on its 9 x 10½-inch series of engines.

ALCO found that Ni-Resist inserts demonstrate outstanding resistance to high temperature, wear, and corrosive attack by combustion gases. Ni-Resist inserts also reduce "blow-by" and lower oil consumption. And because the thermal expansion characteristics of Type 1 Ni-Resist alloy closely match those of aluminum alloys used for heavy-duty pistons, ALCO found that the bond between the two was excellent.

Recently, ALCO found a way to stretch its piston life further... well into the million mile class. A procedure has been developed to machine off the old Ni-Resist insert ring carrier when it becomes too worn for further services, and replace it with a new Ni-Resist insert ring carrier (see picture above right). The new carrier, by an ALCO patented method, is shrunk-fit and welded into place. Through this procedure, engine users are getting more than two million miles of life from their pistons.

Ni-Resist castings boost life of many diesel engine parts

No other cast metals provide such a useful combination of engineering properties in many diesel engines as the Ni-Resist nickel-containing cast irons . . . in *exhaust manifolds* and *valve guides* to resist 1400°F temperatures while matching expansion properties of associated metals . . . in *cylinder linings* to resist corrosion from water and acid combustion products . . . in *pump impellers and housings* to resist erosion by high velocity cooling water . . . in many other parts.

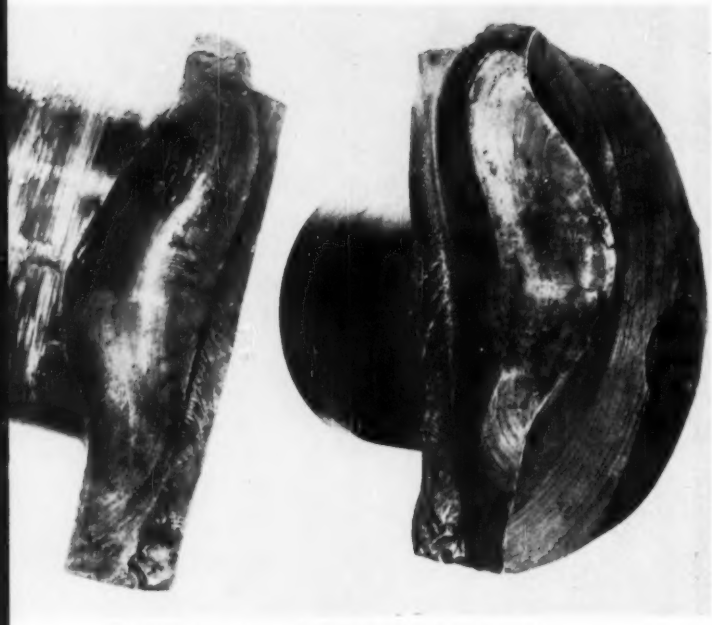
When you buy diesel equipment with Ni-Resist parts, you can be sure of lower maintenance costs and better performance. So specify Ni-Resist nickel-chromium cast iron in the places where it can do you the most good. *Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

NI-RESIST®

NICKEL MAKES ALLOYS PERFORM BETTER LONGER



Disheartening picture of expensive failure. It could, like others shown, have been avoided. Here driven equipment caused excessive end-load on crankshaft (discussed in text) breaking the shaft, cracking the block and damaging bearing caps and supports.

Broken Crankshaft? WHY?

by W. E. Irwin, Manager, Service Department
Industrial Engine Plant, Caterpillar Tractor Co.

The "why" of a broken crankshaft can spell the difference in who picks up the tab—you or the engine builder under his warranty. Regardless, *no one wins.* It's better to avoid such troubles by knowing some of the common causes of crankshaft failure and their prevention.

"YOUR ENGINE broke a crankshaft and ruined our torque converter." Or "Your engine failed and we expect you to give us a new engine, or at least a new crankshaft and cylinder block." These are typical of remarks that company representatives often hear when investigating a major mechanical failure. It's a natural reaction to blame the manufacturer.

It's not that easy. Any manufacturer worth his salt honors legitimate warranty claims but he cannot and should not be expected to issue a blank check with each engine sold. The extent of liability is generally limited to engine damage resulting from crankshafts and other components that fail because of "defects in materials or worksmanship".

Facts accumulated over the years prove that odds are heavily in favor of some external force or condition causing crankshaft failure rather than it being the fault of the product. Today's emphasis on quality control is further lengthening the odds. But sometimes crankshafts do break so let's look at some of the causes. Prevention of trouble starts with an understanding of what's happening.

There are two major bad actors that account for the majority of crankshaft breakage: (1) excessive side and/or thrust loads: and (2) torsional vibration. Here's what can happen when one of these conditions exists.

Watch out for high side loads . . .

No matter who builds the engine there is a definite limit to the stress for which the crankshaft and bearings are designed. It is not reasonable to expect them to withstand the extreme stresses that can be imposed by misaligned or improperly applied driven equipment.

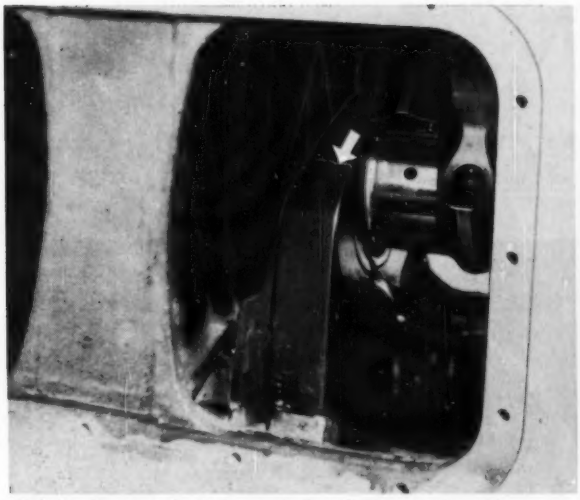
Recently a relatively new engine on a drilling rig experienced a severe seizure of the rear main bearing. Both crankshaft and cylinder block were ruined to the tune of $10,000. The engine was driving directly into an air clutch. An on-the-job check showed that the inner drum of the clutch was badly misaligned in relation to the outer drive ring.

Shaft and rear main bearing are designed to stand normal bearing loads, weight of the flywheel, plus a generous overload as a result of the built-in factor of safety. Here, excessive side load resulting from the air clutch misalignment was enough to break down the oil film, causing seizure.

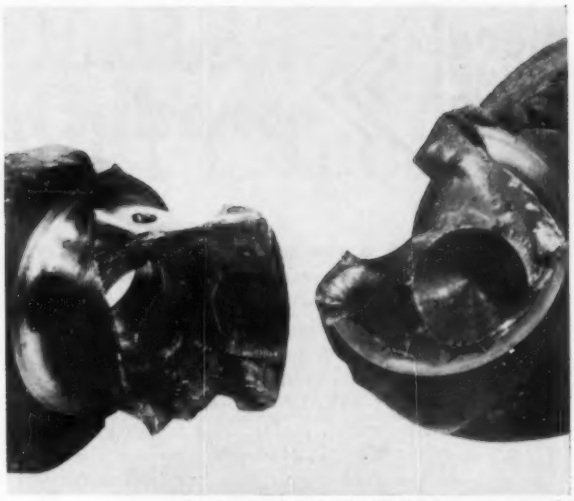
Such side loads also produce high bending-type loads. Two things happen. First, the load is trying to bend the shaft in one direction while it is rotating. Thus, metal around the journal, in the fillets and in the throw webs is being alternately stretched and compressed. Fatigue is rapid and continued running will usually result in a jagged, complete fracture near the fillet.

The second thing that happens can accelerate the failure. As the shaft tries to bend in the bearing bore, the whole load can become concentrated in a small area of the bearing. The oil film is broken down and often the bearing metal can't take it and is deformed. Seizure and final failure is the result.

While alignment of any driven equipment is harmful, alignment of air clutches is critical. The higher the air pressure in the boot, the closer the alignment must be to keep side loads within safe limits. Misaligned air clutches can cause failure to any member to which they are fastened—engine, torque converter, compound, pump or other attachment.



High bending-type loads from misaligned driven equipment usually results in a break that starts in the fillet and progresses through the throw web.



Fractures due to torsional vibration are generally characterized by a break at a 45-deg angle.

And high thrust loads too . . .

A properly designed and installed crankshaft has some end-play. It needs this room in which to breathe with changes in length due to temperature conditions. Thrust bearings are provided, often at the rear main, to handle nominal thrust loads. Again, there is a limit to what they can take.

In one case, several diesel engines powering torque converter-equipped excavators ran into rear main thrust bearing failures. The front thrust flange of the rear main bearing became badly scored and in some cases broke off. Why?

It was found that the power-train design allowed the torque converter to exert a linear pull on the crankshaft of several thousand pounds under full load conditions. When a design change was made to include a thrust bearing to absorb the converter's end-load and to eliminate the rigid connection of the converter shaft to the flywheel, thrust bearing and crankshaft failures were eliminated.

Improper positioning of driven equipment, resulting in preloads on the crankshaft thrust bearing, is another thing to watch. A typical case, improper shimming, caused several thousand dollars damage to a new drill rig engine. Drive was through a coupling into a torque converter. Spacing between the converter and engine was not properly shimmed so that when the coupling was made up, the crankshaft could float. Instead, the shaft was jammed forward with great force.

Result? The thrust flange on the rear main was broken off completely; the crankshaft broke through the web next to the rear main; the cylinder block was cracked through the rear bearing support; and the rear faces of all main bearings caps and supports were badly gouged.

Then there are torsional failures . . .

Torsional vibration is a very complex subject and one that the manufacturer considers when he builds the engine. In the field, there are only a few things to know and watch.

Every system—an engine, an engine-generator or an engine-pump combination—has a certain natural system frequency. At the factory, torsional vibration dampers are mounted, usually on the front end of the crankshaft, to insure that there will be no "criticals" of any importance within the normal engine speed range.

This vibration damper looks like a tiny flywheel, is usually found at the front end of the crankshaft. A steel ring is sealed in the housing with a complete fill of a silicone fluid. Clearances are in thousandths of an inch and to be effective the ring *must be free*. Damage to the damper by prying or impact can ruin its effectiveness. So be careful of the damper.

Viscous dampers of this type are "untuned", that is, they are effective over a broad speed range. Engine overspeeding can introduce a critical vibration speed point that was not considered in the engine design and for which the damper is not effective. So avoid overspeeding.

Natural frequency of systems were mentioned. If driven equipment is added indiscriminately, frequency characteristics are changed and it is possible that the damper will be overloaded and damaged. So give this some thought and seek competent advice before making extensive field modifications.

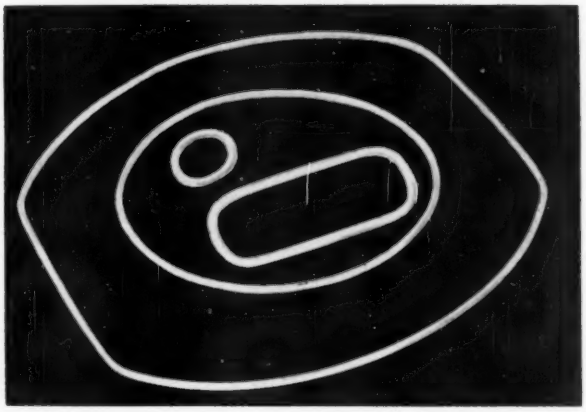
To recap . . .

When damage occurs to an engine's crankshaft and bearings, regardless of the cause or who is at fault, there's never a profit, only a loss . . . nobody wins. Manufacturers can only be expected to accept responsibility for "defects in materials and worksmanship". These are not common in modern heavy-duty diesel crankshafts and bearings and if they should occur can be easily verified by physical and metallurgical tests.

By far the majority of failures have been found to be the result of external forces created by conditions beyond the control of the manufacturer. Two common causes of failure have been discussed. Awareness and understanding of these, plus action to avoid the conditions, will mean that everyone profits . . . everyone wins.

diesel power new products

GASEALS, a new approach to high pressure and temperature sealing, is a new design "tool". Successful in the electronic-electrical field, they are attracting interest of heavy industry, including the diesel field. They offer a simple, low-cost solution to tough problems like cylinder head sealing. GASEALS are hollow metal rings of tubular section containing a pressurized (600 psi average) inert gas. Materials can be mild steel, stainless, monel, cupro-nickel or copper alloy. One ring usually does the job . . . can be reused. Joint faces are grooved to a combined depth less than the seal's diameter to avoid undue seal distortion. Hermetic sealing, effective over a wide temperature-pressure range, is obtained. Drop us a Reader Service card for full details.



American Air Filter's Familiar Cycoil oil bath filter has been streamlined and simplified—the motor-driven oil circulator found on previous models has been replaced by a completely automatic pneumatic lift. AAF's new system delivers positive oil lift at all air flows and with control of oil feed. Savings in installation and maintenance of formerly-required pumps should be considerable. You'll have no electrical power complications—and the new Model "C" PO1 Cycoil offers you a low-resistance self-cleaning air filter that has no moving parts. Secret of AAF's new Cycoil is their use of incoming air to lift reservoir oil to the distributor plate. Other features include a handy new clean-out door and a quick-check "bullseye" gauge. Further information is available—use our Reader Service card.

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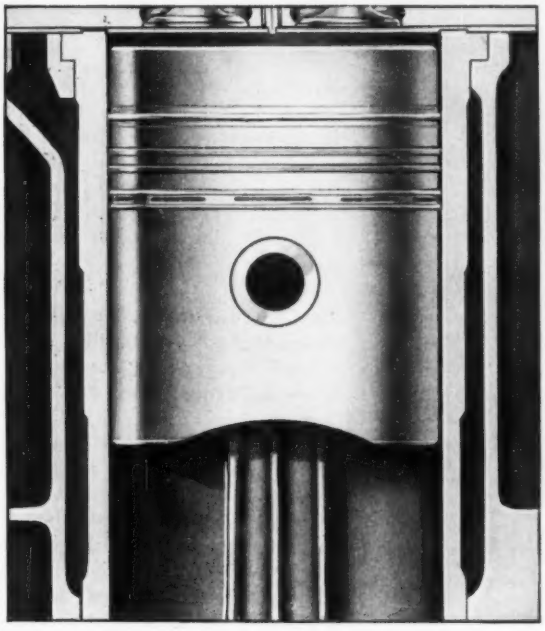
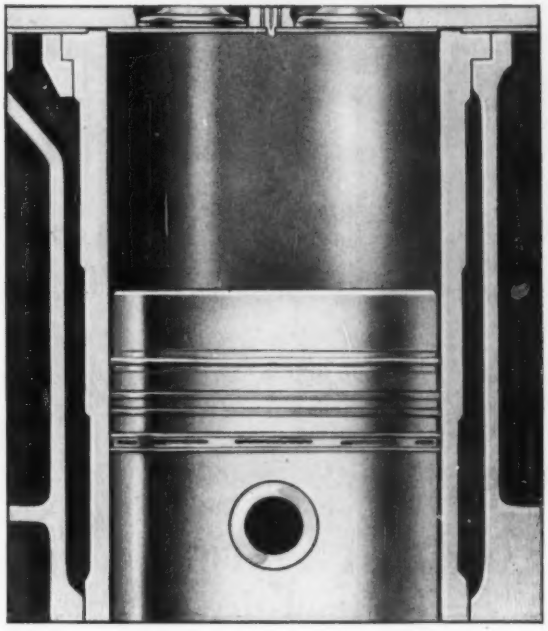


HERE!

...at the moment of ignition when compression and temperature changes are greatest, PC rings maintain Mean Effective Pressure for sustained power.



HERE!

...near the completion of the power stroke when diesel combustion pressures continue to be high, PC rings resist sustained temperatures and pressures to maintain M.E.P. for full stroke power.

CHROME PLATED SURFACES on top compression ring and oil ring resist extremely high diesel pressures without scuffing or scoring. The result: thousands of hours of positive oil control and double life for pistons, rings, and cylinders!

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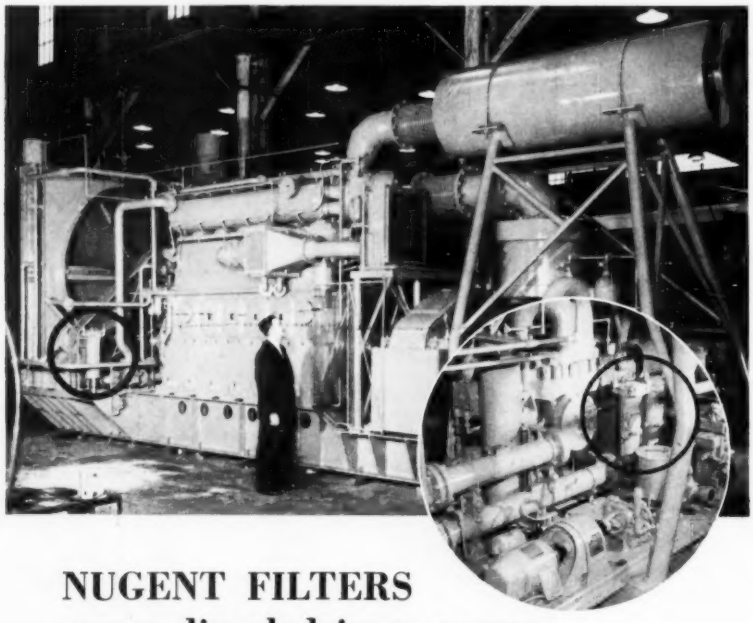
Laminated Shim to Make Rocker Arms

Laminated Shim Company, makers of the "peel-off" type of shims, has acquired rights to manufacture and distribute the Leake Rocker Arm for internal-combustion engines. Before precision-type bearings became prevalent, laminated shims were widely used for adjustment of connecting rod and main bearings. Some are still being used.

Unique feature of their new product, the Leake arm, is that it is stamped to finished form from a single piece of steel.



NUGENT FILTERS serve diesel-driven pump in Sheikdom of Kuwait

Nugent lube and fuel oil filters provide maximum filtering protection for this skid-mounted pump package. One Nugent 1555-4S laminated fiber disc filter handles the lube oil for the 1000 HP Enterprise Diesel Engine powering the crude oil pump. Two 1555-4S units operating in parallel filter the heavy crude fuel oil consumed by the engine. The equipment is now in service in the Sheikdom of Kuwait on the Persian Gulf.

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"Is that pressure cap good or isn't it?" "I'm losing water—but from where?" Common questions you'll hear in many shops. But a new Truckstell pump-type cap and cooling system tester on the work-bench removes all doubt—eliminates throwing away perfectly good caps, helps you locate that leak in a matter of minutes. Truckstell's Model T-230 can be used to test 99% of all trucks and farm tractors in use today.

Air-Cooled Torque Converter Efficient, Easy to Install

Clark Equipment Company's new air-cooled torque converter can be used on existing engines—10 to 50 hp—without any extra coolant lines, without heat exchangers or fan. Fitting on a standard SAE No. 4 flywheel housing, Clark's new air-cooled torque converter has a 9-in. wheel rated up to 80 lb-ft torque input. Stall torque ratio for the new converter is 1:7 to 1. Its dry weight is only 73 lb. This new torque converter should especially please the operators of small diesel-powered road rollers and cranes, farm tractors, winches mixers and many other types of industrial equipment. How to find out more? Just use the handy Reader Service card in the back of the magazine.

Handy Air-Driven Chisel

Here's a tool that will cut those rivets for you, drive 'em and break welds, punch sheet metal holes, split nuts, shear bolts— well, you name it! It will cut your maintenance job time. Called "Sioux Slugger," Albertson & Company's new air-driven chisel features a one-piece barrel and a pistol-grip handle that's cast iron. Comes with seven attachments.

NEW PRODUCTS ►

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New International DCO-405's Now Rolling Down Production Line

Production is underway at two International Harvester plants on their new DCO-405 diesel-powered highway tractor. Designed to meet the rugged requirements of long-haulers, the new DCO-405 will have a gross combination weight up to 79,000 lb. Offered in 4-wheel and 6-wheel models, they'll contain some surprising styling, performance and driver-comfort features.

I-H's new cab-over-engine model is claimed to have less wind resistance per sq. ft. Available in single-axle, tandem-axle and trailing or pusher axle with Cummins engines from 170 to 335 hp, these new trucks will have a choice of 54, 72 or 80-in. cab. 72-in. cab comes as conventional or sleeper. 80-in. as a sleeper only.

Extensive use of aluminum in steering gear cases, engine mounting brackets, cab hinge brackets, battery box and cover has reduced weight. And the driver has been well taken care of—with new all-season ventilating system and torsion-ride seat, repositioned controls and gauges.

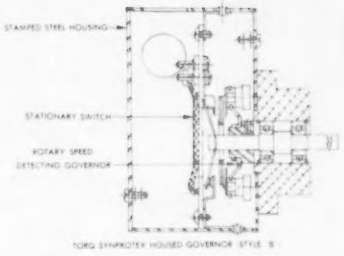
A wide selection of optional equipment makes it possible for you to customize the DCO-405 to your specific requirements.

Flexible Metal Pressure Hose

If salt spray and salt water are your headaches—here's a product designed for you. International Metal Hose Company's new line of flexible metal hose, called Interlox Pressure Hose BD-15, is available in coated galvanized steel, stainless steel and phosphorbronze. Meeting all Government specs, IMH's hose is particularly recommended for carrying high-pressure hot and cold liquids. Their phosphorbronze hose was developed to reduce magnetic permeability and to check weather-cracking problems. For additional information, use our Reader Service card.

RPM Watchdog

"Synprotex" speed-detecting switches are claimed to be capable of detecting pre-determined high and low limits from 500 to 4000 rpm within 1%. Virtually frictionless, these governors from Torq Engineered Products are actuated by speed alone, independent of voltage or load from environmental conditions. They now come in stamped steel boxes with wiring knockout—sounds like a good way to cut your downtime caused by overspeed and underspeed operation.



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diesel power new literature

Four Horsemen of the Space Age

That's the title of an extremely interesting and thought-provoking 24-page booklet we received this month from H. O. Penn Machinery Co., Inc., our local Caterpillar distributor. The four horsemen in this case are "fire, flood, hurricane and war." And we don't believe we've ever seen the case for standby power presented so effectively. Theme of the booklet is that your commercial electric power could fail *and has failed* when a man shot a rifle at a high transmission line . . . when a cat slipped into a transformer . . . when a car plunged off the road, snapping a power line pole. Vital electric power—needed at a hospital operating table, needed at a baby chick hatchery, at a plastics plant and a 1000 other places—stopped completely. It couldn't happen—*but it did*. Caterpillar's illustrated booklet compares diesel generator sets with other forms of power. Back of the booklet contains an excellent section on "How should your diesel electric set be equipped?" You can get your copy by filling out our Readers Service card.

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Off-Highway Torque Converters

If you're running off-highway vehicles, here's an informative folder that will interest you. Clark Equipment Company's 4-page booklet describes pretty completely their new 14-in., 15-in., and 16-in. torque converters for heavy off-road use. Includes power curves. Interested? Simply jot it down on the Reader Service card in the back of the magazine.

Now Hear This . . .

Emergency power plant-operation is the subject of a 70-page U. S. Navy Bureau of Yards and Docks manual, published by the U. S. Department of Commerce. MOBILE EMERGENCY POWER PLANTS includes specs and detailed suggestions for operation and maintenance of mobile and portable diesel-electric generating plants. Featured in the discussion are portable diesel-electric 600-kw generating sets, light weight and heavy-duty. It's available from the U. S. Department of Commerce, Washington 25, D. C., $1.75.

Guide for Choosing, Using Battery Chargers

Technical data from Exide will be helpful in selecting and using specific models of their constant-voltage, silicon-rectifier battery chargers. Included are curves and statistics on charger performance at various electric loads, the data sheets also contain diagrams and instructions for installing associated alarms and ground detection systems.

As an aid to selecting the proper sizes and models for the required application, 32 basic sizes with 18 additional sizes available for specialized charging jobs are listed Direct-current outputs range from 1 to 400 amperes.

Product data highlights the hermetically sealed silicon diodes for current conversion, fully efficient for the life of the charger, and the magnetic-amplifier regulating system that automatically maintains proper voltage. Looking for a battery charger? If so, you'll want this data.

New Oil Cooler Catalog

How you can keep it cool is the subject of a new 10-page catalog from Young Radiator Company. Oil-to-air and oil-to-water oil coolers for torque converters, industrial installations and marine transmission are thoroughly covered. Includes descriptions of mobile and stationary applications on engines up to 600 hp along with diagrams and performance charts. If cooling is your particular problem, looks like it may pay you to take a gander at this new catalog.

Specification Bulletins on Trojan Tractor Shovels

Two new bulletins from Yale & Towne Manufacturing Company tell about engineering features of the Models 134 and 164 Trojan tractor shovels. These features, according to the company, enable the two new models to deliver maximum production combined with fast, economical operation.

Just Off The Press

If you enjoy looking through new equipment catalogs — and who doesn't?—Allis-Chalmers has a nice thick pack of 'em just off the press. Rock wagons and pull scrapers . . . TL-16 and TL-20 Loaders . . . Forty Five Motor Graders . . . HD-11G Tractor Shovels . . . rippers and sideboom and a whole bevy of attachments, they're all here in bright orange colors, backed up by detailed specs and dimensions. And, there's a word or two about the kind of performance you can expect from each piece of equipment.

New Aeroquip Catalog Available

Helpful feature of Aeroquip's new catalog—covering hose and fittings, adapters, self-sealing couplings and cap-plugs and sleeves—is their "Hose Selection Chart" that lists applications and fluids for which hoses are recommended. This attractive and practical catalog is available with either plastic binding or with a Kalamazoo-punched back if you're planning to put it in a counter record system. Use our Readers Service card to get your copy.

Entertaining and Enlightening . . .

Fuller Manufacturing Company's latest issue of TRANSMISSION TOPICS takes you along with TV's Jack Linkletter in his $300,000 mobile supercoach . . . takes you to the heart of the Brazil where they're busy carving a new 1200-mile highway from the jungle. Plus, you'll get inside dope from International Harvester on analysis of engine failure and schedule of forthcoming Motor Fleet Supervisor Training Courses for 1960. How to get your copy? Just fill out Reader Service card—and there'll be a copy in the mail to you pronto.

Re-Designed Clark Gas-Engine-Driven Compressors Described

Clark Bros. Co. new bulletin gives a complete rundown on their re-designed line of turbocharged Clark HRA-T Gas-Engine-Driven Compressor. Illustrations along with complete dimensions and specs give you a good idea of the changes Clark has made in their crankcase, bed section, pistons, crosshead and running gear to handle the higher hp developed from turbocharging.

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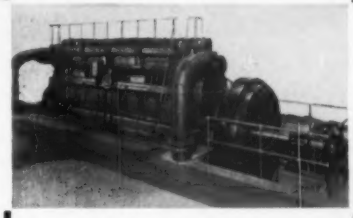

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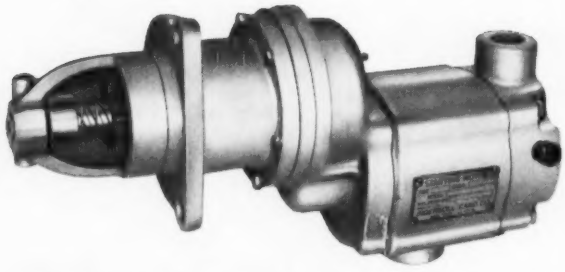

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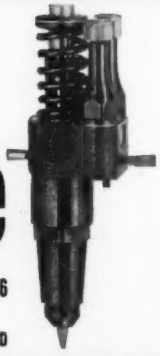

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America's largest GM fuel injector rebuilder

Sludge in engine ends with switch to STANODIESEL Oil M

Situation: For five years a 1,400 hp. engine in the Municipal Light Plant, Arcadia, Wisconsin, was operated on STANODIESEL Oil M. During this time the engine ran free and clean. It carried a major share of the plant's 20,000 kw. output. A decision was made to switch the engine to another lubricant since it was believed one oil was as good as another.

What happened: Within two years the engine had sludged up so much, the oil had to be removed and replaced by STANODIESEL Oil M. Three months later the engine had cleaned up and was again carrying its share of the plant's load.

Clean engine operation is possible with STANODIESEL Oil M because of its superior base stock and its combination of additives that are available in no other oil. Superior base stock and exclusive additives give you these cost-saving operating and maintenance advantages: less sludging, low oil consumption, reduced port deposits, fewer stuck rings, less need for ring replacements, less cylinder wear, lower filtration costs, fewer bearing problems.

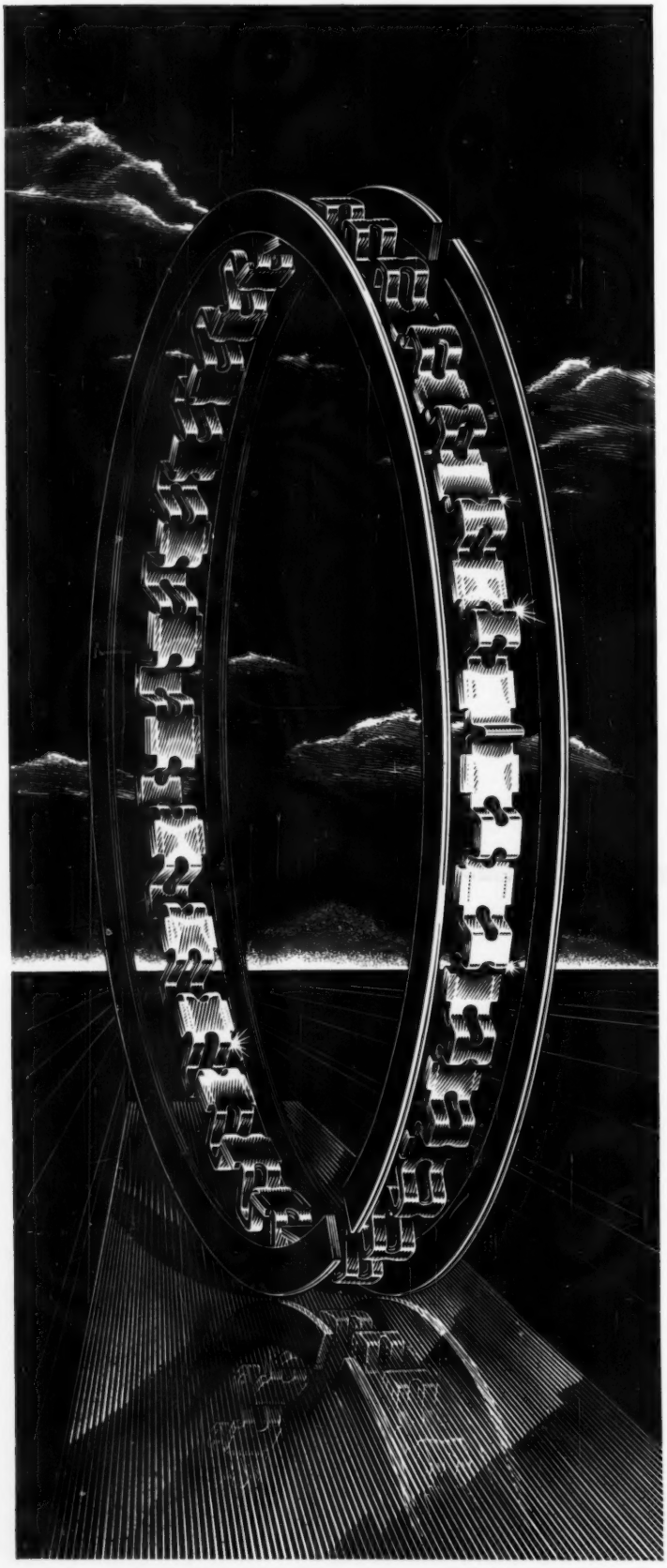
Get more facts about STANODIESEL Oil M. Call the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

The team that got the engine back in shape; (l. to r.) Vernon Schwertel, Ronald Darbo and Standard's Fred Parkinson. Providing lubrication technical service on problems like this one is not new to Fred Parkinson. He's been doing it for 11 years. He has further qualification for such work—an engineering degree from Brown University. Fred has also completed the Standard Oil Sales Engineering School.

Quick facts about STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by economy fuels.
- Maintains film on difficult-to-lubricate parts.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.



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this new metal delivers unique performance

Sealed Power's stainless steel oil ring is now available for many lightweight, over the highway type diesel engines. Because of stainless steel's unusual properties, this Sealed Power ring stops smoking—maintains its original, built-in tension.

The oil ring expander (being of stainless steel) resists the pitting and etching effects of the gases of internal combustion engines. The surface stays clean and smooth; return oil vents do not plug.

Stainless steel has no significant tension loss at engine operating temperature. This means the expander continues to exert the proper, predetermined pressure on the side rails. They, in turn, have the proper scraping action against cylinder walls far longer.

Other key features: proper cylinder wall conformability • quick seating • chrome-plated side rails for long life • easy assembly and installation.

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Stainless Steel Oil Ring